

THE COMMERCIAL SPACE LAUNCH INDUSTRY

HEARING
BEFORE THE
SUBCOMMITTEE ON
SPACE SCIENCE AND APPLICATIONS
OF THE
COMMITTEE ON
SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
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(III)

THE COMMERCIAL SPACE LAUNCH INDUSTRY

FRIDAY, NOVEMBER 30, 1990

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS,
Washington, D C.

The subcommittee met, pursuant to call, at 9:15 a.m., at the Visitors Center, John F. Kennedy Space Center, Cape Canaveral, FL, Hon. Bill Nelson (chairman of the subcommittee) presiding.

Mr. NELSON. I will call the meeting to order, the meeting of the Space Subcommittee of the U.S. House of Representatives, Committee on Science, Space, and Technology.

We're going to have a very strong hearing today. We've got a star-studded cast that's going to be presenting testimony in three different panels. This is a continuation of hearing on space commercial policy that started back in 1983 with the enactment of the Space Commercial Act in 1984, and a series of other Acts over the last several years.

It is the process of a congressional committee to render oversight as to the law and its implementation by the agencies involved, as well as to set policy for the future. Today, we are concerned about the subject at hand, space commercialization, in particular the commercial launch industry. What better place to have this than at the location of where our space commercial launches in America take place.

I might say that in the six years that I've been chairman, this is the first formal hearing. We've had many informal briefings as our committee has been in and out of the Kennedy Space Center. I was always reluctant as chairman to come here to have a full-blown, formalized hearing, because I didn't want anybody to think we were doing it for political purposes. Well, now they can't say it's for political purposes.

[Laughter.]

Of course, I am delighted to have with me our ranking member, who is a dear personal friend and with whom I have shared the leadership of this subcommittee over the last several years, and until his seniority took him to the heights of the ranking member of the full Committee in the last couple of years, he, as I, had to fight to get the leadership of this subcommittee six years ago. We had the pleasure for the four preceding years of sharing the leadership duties of this subcommittee.

Bob Walker is a pleasure to work with. He is an example of a Member of Congress that, when you recognize that there is a subject of national interest, realizes that that subject does not have to

be approached in a necessarily partisan way but can be done in a cooperative way. So what a privilege it has been for me to share with him as we have tried to offer leadership to the Nation's space program.

Now, this topic is fitting on commercialization because expanding the private sector in space operations has been a goal of ours, has particularly been a goal of Bob Walker's, in our years in the Congress.

Government once had the monopoly in the space business, and it was the only way to provide an available ride into space. And then, with the emergence of the European, the Ariane rocket, other than they being a western nation, the United States was the only other western nation with capable regular access to space. But that role changed dramatically. It changed about four-and-a-half years ago when right near this spot Challenger exploded ten miles high, because that vehicle had even been appropriately named the space transportation system, STS. It was our means for all payloads to get to space. And so we realized in retrospect that that was a mistake, that we needed to complement the extraordinary capabilities of a reusable vehicle such as the space shuttle and complement that with ELVs. That gave our capability that we are now developing.

Then with the Government taking a seat to the side on the commercial launch business, the way was opened for space entrepreneurs to begin selling access to space through the use of unmanned expendable launch vehicles. During the time that I've had the privilege of being chairman of this subcommittee, this committee has passed laws to try to reduce the amount of red tape faced by the companies who want to get into the launch business or through launch. Agencies such as NASA and the Department of Defense have cast aside some of their old ways of doing business and, instead of building and launching their own rockets, they are now moving toward purchasing launch services much in the same way that transportation is bought here on earth-bound travel.

Well, it takes time for dramatic changes to take hold, and so that's, in part, what we're here today for. From the commercial launch companies—McDonnell Douglas, General Dynamics, Orbital Sciences—we hope to learn their view of what must be done to knock down any of the Government roadblocks.

And from our Government witnesses we look forward to hearing what efforts they are undertaking to develop new technology to make our commercial launch companies more competitive on the world market. And then from representatives of two of the most aggressive State space agencies, Florida and Hawaii, we hope to learn what obstacles block their way into the space business. USBI, part of United Technologies, which has a major presence in this area, will also tell us about the efforts of the Australians to build a new commercial space port on that northern part of that island nation.

Now, all of this discussion is within the arena of understanding that space has become an international business. Also on our witness list today is Hughes Aircraft, which manufactures communications satellites for customers, and those customers are around the

world. We are looking to Hughes to tell us what its customers look for when the shop around for launch services.

Well, in the past 12 years we have seen the first flight of the only reusable manned space ship, and we have seen that go on now to 30-plus launches. The most recent will come in another couple of days if the weather holds. We have begun development of a permanent research laboratory in space, the station. We have set a goal to move out into our solar system headed toward Mars and beyond, and at the same time we have begun to look out at one of the greatest space ships in the solar system, Mother Earth, to better understand her environment and what we should do to be good stewards in protecting it.

Just as Challenger reminded us of the risky business of space exploration, I hope the emerging international nature of our space efforts in the Nineties is going to bring us to and provide us with a peaceful bridge among nations in which we can better understand each other.

I believe that the exploration of space offers us more information. Our efforts to understand the solar system represents the very essence of America, and it is part of our sense of pride and prestige. Part of the character of this country is that we are, by nature, explorers and adventurers, and we never want to give that up. If we do, we become a second rate nation. But we're not, because that's the essence of us as a people. So it is with that flavor that we start this hearing.

I want to turn to my colleague, Bob Walker of Pennsylvania, for his comments.

[The prepared statement of Hon. Bill Nelson follows:]

OPENING STATEMENT
CONGRESSMAN BILL NELSON
CHAIRMAN
SPACE SCIENCE AND APPLICATIONS SUBCOMMITTEE
NOVEMBER 30, 1990

It is indeed a pleasure to be here today. It is fitting that the topic of this hearing is the commercialization of space. Expanding the involvement of the private sector in space operations has been a goal of mine throughout my years in Congress.

Government once had a monopoly on the space business, providing the only available rides into space. In fact, before the emergence of the European Ariane Rocket, the United States was the only western nation to capable of regular access to space. The government's role changed four years ago, however, when it was decided to stop using the Space Shuttle as a space truck, delivering commercial satellites into orbit. Rather than risk sending astronauts into space to perform a task that really did not demand the presence of humans, the shuttle was reserved for research and science missions.

With the government out of the launch business, the way was cleared for space entrepreneurs to begin selling access to space using unmanned rockets. During my time as chairman, this subcommittee has passed laws to reduce the amount of red tape faced by companies wanting to enter the launch business. Government agencies such as NASA and the Department of Defense, which have representatives here today, have cast aside some of their old ways of doing business. Instead of building and launching all their own rockets, they are moving toward purchasing launch services in much the same way transportation services are bought for earth-bound travel.

We aren't at that point yet. It takes time for such dramatic changes to

take hold. And that, in part, is what we are here to discuss. From the commercial launch companies here today -- McDonnell Douglas, General Dynamics and Orbital Sciences -- we hope to learn their view of what must be done to knock down any government roadblocks that remain in the way of their efforts to sell a ride to space not only to our government, but to private satellite owners around the globe.

From our government witnesses, I look forward to learning what efforts they are undertaking to develop new technology to make our commercial launch companies more competitive on the world market and what they are doing to help our fledgling commercial launch industry serve it better.

And from representatives of the two most aggressive state space agencies in America -- Florida and Hawaii -- we hope to learn what obstacles block their entry into the space business. USBI, which has a major presence in this area, also will tell us about efforts by the Australians to build a new commercial space port on that island nation.

All these discussions are being held with the full awareness that space has become an international business. Also on our witness list is Hughes Aircraft Company, which manufactures communications satellites for customers around the world. I am looking to Hughes to tell us what its customers look for when they shop around for launch services. What factors make a customer choose the Ariane system over U.S. companies, for example?

I have been privileged to work in space policy during one of the most dynamic periods of our exploration of space. In the past 12 years, we have seen the first flight of the only reusable manned space ship in use today, the space shuttle. We have begun development of a permanent research laboratory in space, the space station. We have set a goal move out into the solar system and place humans on Mars. And at the same time, we have begun to look back at the greatest spaceship in the solar system, Mother Earth, to better understand her environment and our effect upon it.

Just as the Challenger accident in the 1980's reminded us of the risky nature of exploring the unknown, I hope the emerging international nature of space efforts of the 1990's will provide us with a peaceful bridge among nations that will help us better understand each other.

I believe exploration of space offers us more than information. Our efforts to understand the solar system represents the very essence of America, and it is part our sense of prestige. Americans tend to view themselves as explorers, dreamers and adventurers. Exploring space and revealing the unknown feeds these urges and provides the nation with a solid sense of progress.

Now, I would like to give Congressman Bob Walker an opportunity speak. Mr. Walker was the ranking Republican member of the subcommittee during most of my chairmanship. We have had a close working relationship over the years that has stepped beyond the bounds of partisanship. By putting our heads together, I believe we have development some innovative solutions to some of the most vexing problems the space industry have faced.

Mr. Walker.

Mr. WALKER. Thank you very much, Mr. Chairman. You are certainly to be complimented for holding this hearing on commercial space opportunities. It is fitting, I think, that you should cap your career in Congress, which has been a most distinguished career, exploring this vital subject because the future prosperity of your State and the rest of the country depends, in my opinion, upon a vibrant commercial space industry. Access to space will determine which countries will be players in the potentially biggest market of all—the space related industry.

I think that there is a major opportunity for us in the years just ahead to have this Nation in the forefront of developing market-based space policies.

Earlier this year I introduced the Omnibus Space Commercialization Act. This bill, if enacted, would provide tax incentives for the space launch industry and space manufacturing. I am going to be reintroducing that bill in the coming Congress and will today be listening for new ideas that can augment the bill. So some of you, as you testify today, I would certainly appreciate if you can come forward with ideas that we ought to be put into a commercialization approach, that you suggest those, so that we can consider them as we're drafting the legislation for introduction early in the new Congress.

Again, Mr. Chairman, I want to thank you for this opportunity, and let me say on the record that I wish you the best of luck in all your future endeavors.

[The prepared statement of Hon. Robert Walker follows:]

ROBERT S. WALKER (R-PA)

OPENING STATEMENT

NOVEMBER 30, 1990

COMMERCIAL SPACE FIELD HEARING

THANK YOU, MR. CHAIRMAN.

YOU ARE TO BE COMPLEMENTED FOR HOLDING THIS HEARING ON COMMERCIAL SPACE OPPORTUNITIES. IT IS FITTING THAT YOU SHOULD CAP YOUR DISTINGUISHED CONGRESSIONAL CAREER EXPLORING THIS VITAL SUBJECT BECAUSE THE FUTURE PROSPERITY OF YOUR STATE AND THE REST OF THE COUNTRY DEPENDS UPON A VIBRANT COMMERCIAL SPACE INDUSTRY. ACCESS TO SPACE WILL DETERMINE WHICH COUNTRIES WILL BE PLAYERS IN POTENTIALLY THE BIGGEST MARKET OF ALL--SPACE RELATED INDUSTRY.

EARLIER THIS YEAR I INTRODUCED THE OMNIBUS SPACE COMMERCIALIZATION ACT. THIS BILL, IF ENACTED, WOULD PROVIDE TAX INCENTIVES FOR THE SPACE LAUNCH INDUSTRY AND SPACE MANUFACTURING. I WILL BE REINTRODUCING THAT BILL IN THE COMING CONGRESS AND WILL TODAY BE LISTENING FOR NEW IDEAS TO AUGMENT THE BILL.

AGAIN, MR. CHAIRMAN, THANK YOU FOR THIS OPPORTUNITY. AND, LET ME ON THE RECORD WISH YOU THE BEST OF LUCK IN YOUR FUTURE ENDEAVORS.

MR. NELSON. Thank you.

I want to make note of a distinguished elected public official here, State Representative Charlie Roberts from Brevard County, who also sits as a member of the Florida Spaceport Authority. Charlie was one of the coauthors of the legislation in the Florida Legislature that set up the Florida Spaceport Authority.

As we start with our first panel, I want to make reference to the fact of a very, very well spoken report that was made by the Aerospace Industries Association to the Department of Transportation Secretary, Samuel Skinner. This AIA report is signed by Al Lovelace, who was designated as the chair of the special subcommittee looking specifically at the subject that we are going to discuss today.

Without objection, I will enter this into the record of this committee proceeding. But I thought, just before we start to take your testimony, that it might be worthwhile just to quote from a couple of sentences.

"At this moment, it is not easy for the commercial launch industry to be optimistic about our viability in the future." That's a rather ominous starting sentence. "If business conditions force our companies to leave the business, our commercial satellite industry will become completely dependent upon foreign transportation to space. Without strong constraints, nonmarket countries—" and he's talking about nonmarket economic market countries such as the Soviet Union and China, the People's Republic of China "—nonmarket countries will be offering satellites at predatory prices similar to the predatory prices offered on their vehicles," and he goes on to say "which could also jeopardize our own satellite industry in the United States. We note the recent announcements by both the Chinese and the Soviets of the development of large communication satellites." End of quote.

He goes on, "To our satellite industry, cost and reliability are two most important parameters." Cost, he's talking about of launchers, and reliability of launchers.

Then I thought I would quote in conclusion the report and the investigation done by the Aerospace Industries Association. "Our investigation does not confirm any bias against commercial launches in today's operations." He's talking about the operation of a Government range, such as the Eastern Test Range, Eastern Space and Missile Center. "However, the misconceptions can be reduced if the philosophy is that this is a national range operated by the Air Force and let that be filtered down from the top. Perhaps this is a topic for a future National Space Council meeting. Some policy announcement, for example, from the Secretary of Defense or of the Secretary of the Air Force in this vein could be quoted to allay customer concerns.

"Tangible evidence that the Eastern Test Range is a national range would be underscored if the Department of Transportation were to provide funding of projects that most directly affect the commercial user."

I will stop the quotations from there. But it's a well thought out, well written document. It is entered as part of the record.

[The AIA report follows:]

AIA REPORT TO
SECRETARY SAMUEL K. SKINNER

ON

*Commercial Space Launch Infrastructure:
An Industry Perspective*

September 1990

GENERAL DYNAMICS
Commercial Launch Services

PO Box 85911, San Diego, California 92138-5911 • 619 496-4000 • FAX 619 496-4055

24 September 1990

The Honorable Samuel K. Skinner
Secretary of Transportation
U.S. Department of Transportation
400 7th Street, S.W.
Washington, D.C. 20590

Dear Mr. Secretary:

At your request, the Aerospace Industries Association formed a committee to provide advice to you on the subject of infrastructure needs of the commercial space transportation industry. I was asked to chair this committee. Other representatives were appointed from TRW, Martin Marietta, McDonnell Douglas, GE Astro, and Hughes. Thus, three launch services companies and three satellite manufacturers were represented.

In approaching this subject, it is important to recognize industry's broad view of the current situation.

There was strong encouragement from the previous administration to start a commercial launch industry. Supporting legislation was passed and various companies stepped up to the challenge. The private sector committed significant funds, in part to upgrade launch facilities. At that time only European competition was envisioned.

Even before the initial commercial launches, our government signed an agreement with the Chinese which, in effect, allocated a share of a relatively thin market to that non-market economy country. Now the decision has been made to permit Soviet vehicles to be used for commercial launches from a third country. The Soviet capability is particularly impressive. Their vehicle reliability is excellent, and according to the trade media, there are 100 of the large Zenit vehicles and 120 small SS-20s that are in storage and available for commercial use.

Our government's plan is to establish fair trade rules to which the U.S. and European Space Agency (ESA) can agree and then require other entrants, such as the PRC, USSR, and Japan to abide by those rules in order to have access to our satellite markets. As you are well aware, the experience to date with enforcing the first US/PRC agreement is not encouraging. It is of utmost importance that the trade agreements developed are both enforceable and enforced.

At this moment, it is not easy for the commercial launch industry to be optimistic about our viability in the future. If business conditions force our companies to leave the business, our commercial satellite industry will become completely dependent on foreign transportation to space. Without strong constraints, non-market countries will be offering satellites at predatory prices similar to their vehicles, which could also jeopardize our satellite industry. We note the recent announcements by both the Chinese and the Soviets of the development of large communication satellites.

We have had reasonable success in our head-to-head competition with Arianespace to date. ESA is now developing the Ariane V with billions of dollars from member countries paying for the vehicle and attendant infrastructure. A much lower cost-per-pound to orbit is forecast. To our satellite industry, cost and reliability are the two most important parameters. How does our nation respond to this challenge? The National Commercial Launch Strategy, which is expected to be released soon, may provide answers. Some of our thoughts that are relevant are incorporated in the report.

With all of the unknowns at this time, industry members are in no position to make additional investments in infrastructure or vehicle product improvement beyond those which are mandatory.

To determine what infrastructure would be most beneficial to the commercial launch industry, our approach was to analyze the current and near-term situation at the national ranges, assess the market over the remainder of the decade, and determine the justification for commercial spaceports when balanced against the projected problems at the national ranges.

After concluding that business and market conditions do not favor a commercial spaceport at this time, we concentrated on infrastructure problems and plans at the Eastern Space and Missile Center (ESMC). Addressing these issues early would be very beneficial to the U.S. commercial launch industry. We have delineated several specific projects for which Department of Transportation funding could assist in the shortfall in the defense budget that is to be expected.

Our Eastern Test Range from which nearly all commercial launches occur, has always been an *Air Force* range. Now it is required to support commercial users. There is a perception, particularly on the part of commercial customers, that commercial launches have a lower priority than government launches. This perception is strengthened by the strict security and safety procedures that are natural for a military base. Our investigation does not confirm any bias against commercial launches in today's operations. However, the misconceptions can be reduced if the philosophy that this is a *national range operated by the Air Force* is filtered down from the top. Perhaps this is a topic for a future National Space Council meeting. Some policy announcement, for example, from the Secretary of Defense or of the Air Force, in this vein could be quoted to allay customer concerns.

Tangible evidence that Eastern Test Range is a *national range* would be underscored if the DoT were to provide funding of projects that most directly affect the commercial user.

The Honorable Samuel K. Skinner

-3-

24 September 1990

I want to thank the numerous government and industry officials who responded to our inquiries and the members of my committee and their staffs for their many contributions to the writing of this report.

We hope that our report will be useful to you. We are available to further amplify our recommendations as you wish.

Sincerely,

A handwritten signature in cursive script, reading "A.M. Lovelace". The signature is written in dark ink and is positioned above the printed name and title.

A.M. Lovelace
President

"The commercial space transportation industry is already assuming a major portion of the functions once performed solely by the Federal Government, providing U.S. access to space for both commercial and government projects. The industry contributes to economic growth and development, provides employment and income opportunities, improves the U.S. balance of payments, stimulates technological innovation, and advances the Nation's long-term security."

"It is Federal transportation policy to:

Enhance the U.S. commercial space industry's competitive position in world markets and work to ensure fair competition in those markets."

"Private enterprise and government bodies must recognize the realities of an international marketplace characterized by government sponsorship of and financial support for competing foreign ventures."

From: A Statement of National
Space Transportation Policy
U.S. Department of Transportation
February 1990

POLICY FINDINGS

"A commercial space launch industry can provide many benefits to the U.S. including indirect benefits to U.S. national security.

The long term goal of the United States is a free and fair market in which U.S. industry can compete. To achieve this, a set of coordinated actions is needed for dealing with international competition in launch goods and services in a manner that is consistent with our non-proliferation and technology transfer objectives. These actions must address both the short term (actions which will affect competitiveness over approximately the next ten years) and those which will have their principal effect in the longer term (i.e. after approximately the year 2000).

- *In the near term, this includes trade agreements and enforcement of those agreements to limit unfair competition. It also includes the continued use of U.S. manufactured launch vehicles for launching U.S. Government satellites.*
- *For the longer term, the United States should take actions to encourage technical improvements to reduce the cost and increase the reliability of U.S. space launch vehicles.*

IMPLEMENTING ACTIONS

U.S. government satellites will be launched on U.S. manufactured launch vehicles unless specifically exempted by the President.

Consistent with guidelines to be developed by the National Space Council, U.S. Government Agencies will actively consider commercial space launch needs and factor them into their decisions on improvements in launch infrastructure and launch vehicles aimed at reducing cost, and increasing responsiveness and reliability of space launch vehicles."

AIA INFRASTRUCTURE REPORT

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PURPOSE AND SCOPE OF THE STUDY

Space is increasingly becoming an arena for commercial and industrial development, as well as scientific and technological progress. A competitive and successful space industry is critical to the United States in the 21st century in order to achieve our national security, scientific, technical, economic, and environment goals. Commercial space activity will be an important means to bring the benefits of space down to earth to the average citizen. The United States' ability to maintain leadership in space is highly dependent on a robust space transportation capability and our success in competing for the rapidly evolving worldwide commercial space business. The entry of the French, Chinese, Soviets, and Japanese into the commercial launch space arena poses a major challenge to U.S. leadership in space. The most important commercial element of the U.S. in the use of space today is communication satellites. If the U.S. commercial launch industry is unable to compete internationally this element will be completely dependent on foreign transportation. A major component in the future success of the U.S. space industry, as defined as an industrial system including launch vehicles and satellites, is the support infrastructure. Without a robust and cost effective space launch infrastructure, all of our efforts in space will be impaired.

The Federal Government has historically played a major role in developing public transportation infrastructure such as airports, highways, domestic waterways, etc. Similarly, there is today a legitimate Federal role in funding the development of space transportation infrastructure.

Secretary Skinner of the Department of Transportation requested advice from the Aerospace Industries Association on this subject. A committee was formed of representatives of three launch services companies and three satellite companies to address the basic question:

What additional infrastructure would be most useful to the commercial expendable launch vehicle industry?

The committee recognized that there are two general categories of launch vehicles that have to be considered separately; the medium and large ELVs (Delta, Atlas, and Titan) currently used for most commercial payloads and operating from the national ranges, and small ELVs (Scout, Pegasus, Taurus, Conestoga, etc.) for which the commercial market has not yet really developed but for which many believe there is much promise.

The committee defined infrastructure in the broadest sense as it sought to understand the major impediments to cost efficient commercial launches. "Infrastructure" is defined as launch pads, vehicle and spacecraft processing facilities, command and control equipment, range support, and general facilities and staff. It includes support items such as electrical distribution, communications, and contractor supply systems. Infrastructure needs were addressed in two categories: (1) those for augmenting the existing national ranges, and (2) commercial spaceport(s) in addition to the current ranges.

This AIA report makes recommendations to the Department of Transportation that would enhance America's commercial space transportation competitiveness by improving the national space launch infrastructure. The report proposes specific programs and financing options that would improve the existing national launch ranges for both large and small launch vehicles and evaluates the feasibility of adding dedicated commercial spaceports to augment the current ranges.

SITUATION TODAY

Eastern Space and Missile Center (ESMC)

The Commercial Space Launch Act of 1984 provided the commercial ELV industry with access to government owned launch facilities and range services infrastructure at the national ranges for which industry would pay only the direct cost associated with use of the facilities. The Eastern Space and Missile Center (ESMC) at Cape Canaveral conducts the majority of the nation's equatorial and geostationary traffic, including all large and medium commercial ELV launches. The commercial space launch industry therefore shares ESMC with both the NASA Space Transportation System and DoD launch operations. The ESMC range is operated by the United States Air Force, who is responsible for supporting U.S. private sector commercial launch activities.

Principal competition for the commercial space business comes from Arianspace, a consortium of European private firms and governments, backed by the European Space Agency (ESA). ESA provides substantial financial support to Arianspace, including the entire cost of developing and qualifying of the launch vehicles, and building the launch complexes and infrastructure at Kourou. Ariane's launch facilities are more modern and commercially oriented than those in the U.S. and are not shared with an active military launch program. Infrastructure needs of Japan, China, and the Soviet Union are all provided by their respective governments. This places the U.S. commercial space industry at a competitive disadvantage in the market with regard to the operability, cost, and customer service orientation of our infrastructure.

Some 25 large and medium ELV launches have been conducted from ESMC in the last year. Today, ESMC is able to support this combined government and commercial manifest, but not always in a timely manner and not without extraordinary efforts by the launch crews and Air Force range personnel. There is a consensus of opinion among the members of the committee, as well as many of the industry and government officials consulted, that existing national launch facilities and supporting infrastructure are *adequate for the current level of demands, but close to the limit*. Over the next decade, ESMC is estimating it will be tasked to support 30 to 34 medium and large ELV launches per year (8 Shuttle, 6 to 8 Titan, 10 Delta, and 6 to 8 Atlas). If launch demand increases beyond this during the 1990s, there is a potential for severe delays.

The committee concludes that the systemic problems hampering NASA and Air Force space operations at the Cape today are also impacting commercial launch vehicle operations just getting underway. The major problems can be segregated into three areas:

1. General age and condition of range equipment, launch facilities, and supporting infrastructure.
 2. Time required for reconfiguring the range to support different classes of launches.
 3. Vehicle designs and infrastructure interfaces which result in long-processing times.
- **Antiquated ESMC Infrastructure** - Generally, antiquated facilities and equipment, including launch control and ground support equipment, electrical supply and telephone systems all inhibit the ability of ESMC to handle current requirements. Obtaining spares for old equipment is a problem. Much of the underlying infrastructure, such as the electrical distribution system, sewage systems, etc., is 30 to 40 years old. A manual patch panel system is used instead of automated digital switching. The telephones are old rotary types. Past appropriations have tended to provide primarily for maintenance with little money for upgrading. This is due in part to the philosophy that existed for a long while of phasing out ELVs and depending solely on the NASA Space Transportation System.

- **Excessive Time for Range Reconfiguration** - The most important operational problem at ESMC today is the excessive length of time required to reconfigure the range from the support of one type of vehicle to another. The limitations in equipment and available personnel necessitate a time in the order of 48 hours to make this shift. The equipment is both old and labor intensive. The range support contractors are limited in overtime for safety reasons and have insufficient personnel to handle surge requirements. This situation greatly exacerbates inevitable launch delays caused by weather or technical problems and the decision making in the event of conflicts.
- **Lack of Range Staffing** - A restrictive condition is a shortage of a sufficient number of properly trained, qualified, and experienced Range personnel. Continuous use of first shift overtime is detrimental to both morale and quality. Because of budget constraints and safety concerns, the USAF has recently ordered reduced overtime levels regardless of missed launch deadlines.

Although there are differences between the various launch vehicles, a typical example of the turnaround problem is that key range people are on duty for perhaps the last ten hours prior to the launch of Vehicle A. After supporting the post-launch needs, if any, there is a rest period of at least ten hours. They return to work and it may take ten hours to do the labor intensive reconfiguring of the range to support the launch of vehicle B. This has to be followed by another rest period before the count can be picked up for the next launch. Superimposed on launch requirements are other critical prelaunch tests that the range must support.

The resultant delay in the order of 48 hours greatly increases the difficulty of the "common-sense" decisions of those responsible for range scheduling. A very common situation is a technical problem during the countdown, say on a Monday, and launch A is scrubbed. Those responsible for that launch have to make an estimate as to when the problem will be fixed. There is an incentive to be optimistic so as not to lose their place in the queue. The decision-maker then must decide whether to let launch A try again on Tuesday and slip launch B to Thursday or reconfigure the range so B can be launched on Wednesday in which case launch A cannot go again until Friday. Obviously, modernized digital switching systems plus sufficient personnel to reduce this range turnaround time is fundamental for increasing the through-put of launches at ESMC.

Scheduling Philosophy - Commercial entities seeking launch services have a general concern, exploited by foreign competitors, that commercial launches have the lowest priority in range scheduling involving both government and commercial launches. Today there is little or no evidence of this in the range scheduling procedures. As a recent example, an Atlas commercial launch had to be slipped due to a technical problem. The decision was made to let the Atlas try again the next day at the expense of a Delta military launch. The vehicle with a commercial payload can be placed in a queue twelve months before the desired launch date. From that time that launch position is retained except for "common sense" adjustments as the launch date approaches. There are launch date changes due to vehicle or satellite technical problems, due to weather, and due to interference with other range activities. It was the latter in which the committee was primarily interested. In the last 12 months a total of 25 major launches, excluding ballistic tests, have flown from ESMC. Although the delays associated with the 48 hour turnaround time and aging facility have been kept at a minimum during this period, considerable effort was required by the range personnel and launch crews to try to maintain schedule.

Data available to the committee indicates that the cost of delay incurred by the ELV launch industry thus far is manageable. An analysis was made of the 15 Delta launches between March 1989 and June 1990 and the delays that occurred in the few days prior to the planned launch date. There were a total of 22 days delay due to range support conflicts. The cost of each day's delay is estimated to be \$5,000/day for the spacecraft team, who generally are not occupied, and ranges from zero for the vehicle team, if all can be kept at other tasks, to \$35,000/day if the team is called in on a Sunday or holiday. These very limited data say that the average delay is 1 1/2 days per launch at a cost of \$7,500 - \$75,000 each.

During this period there were seven STS launches. Conflicts with the Shuttle were responsible for 17 of the 22 days delay. A Shuttle abort has a greater effect than the abort of other vehicles. Due to the worldwide support activities and the massive number of people involved, there is considerably less flexibility for moving the Shuttle schedule than with ELVs. This suggests that the conflict problems may grow if there are appreciably higher Shuttle launch rates in the future.

- **Labor Intensive Vehicle Processing** - Because of the nation's over reliance on the Shuttle between 1975 and 1986, no new medium or large expendable launch vehicles have been developed by the U.S. in 25 years. Although the fleet of Atlas, Delta, and Titan ELVs have been steadily evolved, improved and updated, the fact remains that none of these vehicles are really optimized for low cost commercial operations. Private industry and government funded improvements have appropriately focused on improved reliability, performance, and hardware cost but have only begun to address improvements in processing and span times that could further reduce cost and improve schedule confidence. Vehicle design and infrastructure are intimately related. The Advanced Launch System (ALS) program has been addressing improvements in vehicle technology which could simplify vehicle processing and pad interfaces and thus ease the burden on launch infrastructure. Budgetary constraints have made the timing for operations of ALS or any other new vehicle uncertain. ALS type technology applied to existing vehicles might be of considerable assistance. However, an ALS-type vehicle using the latest technology is essential if the U.S. commercial launch vehicle business is to continue well into the future.
- **Lack of Commercial Customer Orientation** - Operating commercial launches from a military operated base has the inherent disadvantage of not appearing to be user-friendly to the commercial spacecraft customer. This is particularly true for foreign customers. For example, Air Force control of access is very strict. Unless prior embassy clearance has been obtained, a foreign VIP cannot be shown certain unclassified facilities even if escorted. Ways must be sought to improve the ESMC image as a commercial base of operations.

Western Space and Missile Center (WSMC)

The West Coast national range is used primarily for launches of ballistic missiles. In the last 12 months only three medium and large ELV launches have occurred. WSMC is the only national range suitable for polar launches. There have been planning discussions about commercial launch operations from WSMC but none are currently firm. The situation could change later in this decade if polar commercial launches become a reality.

WSMC has antiquated infrastructure similar to ESMC and range personnel are doing similar long-range plans on infrastructure needs. WSMC problems are less severe since advantage was taken of the introduction of new vehicles such as Shuttle and Titan IV to modernize some portions of the infrastructure. Since the probability of commercial launches from WSMC is unclear at this time, the committee decided not to give that range further consideration in this study.

DEMAND GROWTH IN THE 1990s

The situation at ESMC, as discussed above, is adequate in meeting today's commercial launch needs, although considerable effort is required to keep on or close to schedule. A key consideration in deciding the desirability and degree of improving the existing infrastructure is the total launch demand that may be placed on the existing system over the next ten years.

The committee collected estimates of future launch demand from the major participants, and interviewees, in this study. These forecasts for the decade do not include major new demand that could be generated by requirements for the Space Exploration Initiative (SEI) and the Strategic Defense Initiative (SDI). These programs represent a major unknown which could substantially impact the launch rate at ESMC. In addition, the Committee noted that Arianespace has a stated objective of capturing 50% of the commercial market. If this objective is met, the U.S. industry would be sharing the remaining 50% with the Chinese, Soviets, and other new entrants.

Consensus of all inputs is as follows:

- (1) The launch rate of commercial payloads on medium and large ELVs is expected to be flat at about eight per year through the end of the decade.
- (2) The launch rate for STS will be between 8 to 14 per year through the end of the decade.
- (3) Ballistic launches will decrease somewhat.
- (4) The small ELV launch rate for both military and commercial payloads may grow substantially throughout the decade, but it is indeterminate at this time.

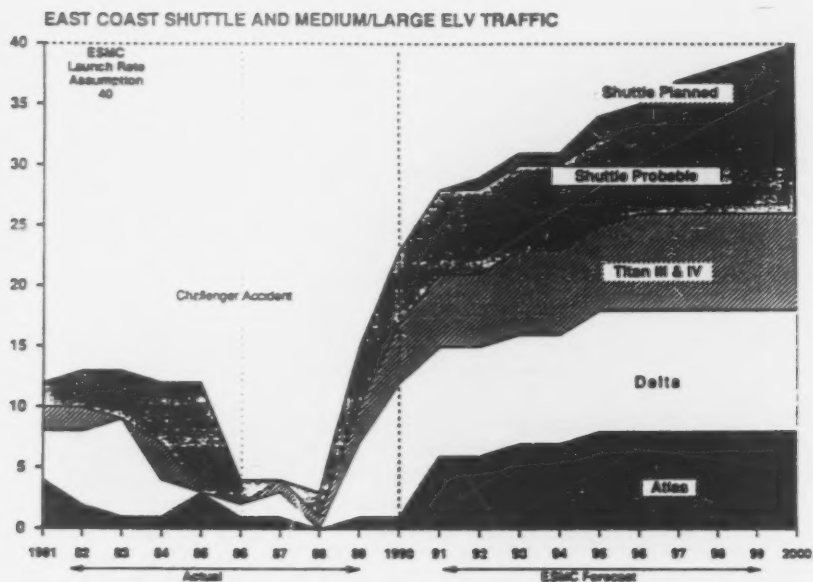
Although the launch rate at ESMC should grow somewhat during the 1990s, such growth will depend upon the Shuttle and small ELV requirements, not upon medium and large commercial launches. ESMC's baseline forecast of 40 per year is considerably higher than experienced in the past decade.

The rationale for improving the existing infrastructure in the near term, therefore, is valid even if there is zero growth in commercial demand in the next ten years. **Some improvements in the infrastructure are mandatory if launch forecasts are to be met.**

TEN-YEAR CCAFS LAUNCH HISTORY FOR ELVs AND SHUTTLE

	1981	1982	1983	1984	1985	1986	1987	1988	1989	LAST 12 CALENDAR MONTHS	NEAR TERM ESMC FORECAST
Atlas	4	2	1	1	3	1	1	0	1	2	1
Delta	4	6	8	3	0	1	2	0	6	11	10
Titan III & IV	2	2	0	3	0	0	1	1	3	5	5
Shuttle	2	3	4	5	9	2	0	2	5	6	6-9
TOTAL	12	13	13	12	12	4	4	3	15	24	27-28
											30-40

*Includes all launches scheduled for 1990



Estimates of requirements for small satellites in orbit, from well-informed people, literally varied from zero to 200 per year by the end of the decade. The uncertainty perhaps is illustrated best formally by a current government RFP for 40 launches; one is to be considered firm and the other 39 as options. The baseline forecast used in the ESMC study is for four small ELVs in the near future, rising to 20 per year by the year 2000. The committee considers these reasonable planning numbers.

The promise of low cost for both the launch vehicles and satellites has great attractiveness for many commercial users, including third-world countries. If the small satellite remote sensing, direct broadcasting, navigation, or mobile communications become a financially attractive commercial venture, then there would be a need to insert numerous spacecraft into low earth constellation. There are schemes such as Motorola's Iridium constellation which requires 71 satellites in a network which might need launch services for up to 200 satellites by the end of the decade. The technical and financial feasibility of Iridium is difficult to assess at this time. If feasible, there remains the question as to whether such a program would be launched in clusters on larger launch vehicles or one at a time on small vehicles. Some of each is most likely.

If the optimism of the proponents of light satellites proves to be warranted, the concept of commercial spaceports should be given careful consideration. A major factor in selection of a location is the type of trajectory required for whatever viable business plans emerge. Some plans call for polar launches, others for equatorial, and others for intermediate inclinations. Airborne or shipborne launchers also could prove feasible.

Our opinion is that the small satellite picture today does not warrant a large expenditure of funds for infrastructure, but it should be monitored very closely. Appropriate planning and perhaps design studies are in order. This is an area in which joint federal and state funding may be quite feasible.

COMMERCIAL SPACEPORTS

The concept of commercial spaceports is gaining increasing interest as an alternative to reducing congestion at the existing national facilities where the needs of NASA, DoD, and commercial launches must be balanced. State governments view publicly financed spaceports as a way to attract high technology space industry and jobs to their districts. Commercial spaceports have been proposed by Florida, Hawaii, and Virginia, among others. The commercial launch industry would also benefit from the modernized facilities and equipment, which a new spaceport could provide. It is envisioned such a spaceport would be managed by a commercial entry but could also support government launches if necessary.

SMALL ELV FUTURE

A prognosis of the demand for small ELV (SELV) launches over the coming decade is important in trying to determine infrastructure needs, but is extremely difficult to make.

Currently, small satellites are most often used to make low earth scientific observations, to demonstrate space payload technology, or to satisfy a national or state government desire to exhibit a presence in space. As such, they do not yet represent a self-supporting commercial market, but the potential for developing such a market sometime in the future is high.

The number of suborbital launches clearly is growing. However, there are numerous sites from which these launches can occur and infrastructure requirements are minor. This class of launch is not considered further for purposes of this study.

Both NASA and the Air Force are currently engaged in procuring launch services for circular and elliptical low earth orbits with perigee altitudes below 400 nautical miles. These government agencies have projected a combined mission launch rate of two to four missions per year for the next four to five years. With the exception of near equatorial inclinations, these missions can be launched from either the NASA Wallops Flight Facility or from VAFB.

The Unified and Air Force Space Commands are exploring and coordinating small tactical satellite operations concepts for DoD components and developing mission need statements validating their requirements. At this stage of concept development, it is impossible to define launch support requirements with any certainty. DARPA is currently procuring space launches on Pegasus, an air launched system developed by Orbital Sciences Corporation/Hercules Aerospace Company on private funds. Other entrepreneurial U.S. companies who have shown interest in entering the small ELV market include Space Services Inc. (Conestoga), American Rocket Company (Industrial Launch Vehicle), Pacific American (Liberty), and E Prime Aerospace Corp. (EPAC). Also, more well established companies such as Lockheed Missile & Space Company (Payload Launch System), the LTV Aerospace (Scout II) are actively pursuing this very competitive market. The previously discussed government ELV launch services market is not sufficiently large to sustain all potential entrants. It is premature to speculate on market development and growth and to predict the launch infrastructure needed to support the emerging small ELV launch services capability.

However, the Commercial Space Launch Act provides that the commercial industry pay only for direct costs of operating from the existing government owned pads and range services. There is no requirement to pay for the cost of developing the original pads, although, in some cases considerable private investment has been committed to improve the existing pads, which remain the property of the government.

Despite the potential attractiveness, the medium and large ELV industry would have great difficulty in justifying capital investments for a commercial spaceport today because:

- The market for commercial satellites is thin and international competition is aggressive and government supported. Although the new National Space Policy Directive provides for foreign fair trade agreements and the sole use of domestic launch vehicles for U.S. government satellites, U.S. companies are currently marginally competitive in open launch services competition.
- U.S. policies for allowing the non-market economy countries into the market are ill-defined.

Even if a commercial spaceport were constructed with a combination of federal grants and state financing, the use fees for commercial launches would be greater than exists now at the national ranges.

As a simple illustrative example: if a \$500 Million spaceport for medium ELVs were constructed with a \$250 Million DoT grant and \$250 Million state revenue bonds, the debt service on the bonds at 10% would be \$25 Million per year. If there were 10 commercial launches per year, which is optimistic, the use fee per launch would have to be \$2.5 Million plus a pro-rata share of the costs for operating and maintaining the spaceport. The total would be substantially higher than the approximate \$3 Million now paid for using the national range. For the foreseeable future, it is believed that the cost for delays due to conflicts at existing facilities will be much less than the total of debt service and operational and maintenance costs with a commercial spaceport.

A new federally funded spaceport in the near term would offer some efficiency gains due to more modern equipment, limited by the fact that the vehicles have the same old design, and fewer schedule delays; this gain could be more than offset by additional logistics and manning costs. The current three contractors use the same launch crews for both military and commercial launches. Unless the commercial spaceport is immediately adjacent to the current range, separate launch crews would be needed. However, an adjacent commercial spaceport would be subject to most of the same interference problems we face today.

Given the current degree of interference between commercial and government launches at ESMC, a separate commercial spaceport for medium and large ELVs cannot be justified. This judgement might possibly change if the government activity increases substantially due to such effects as increased STS launch rate, Space Station resupply, and SDI and SEI initiatives.

The committee concluded that updating the ESMC infrastructure in the near term is more beneficial to U.S. commercial ELV competitiveness than developing a new stand-alone commercial spaceport.

The situation for small ELVs is different. There are numerous existing sites for suborbital launches, but if the commercial market for putting small satellites into orbit develops rapidly as some predict, a commercial spaceport may become justifiable since current infrastructure is very limited. Costs of such a facility would be much lower than one for medium ELVs and development times shorter. The optimum location could be a function of the particular market segment. Some such as the Motorola Iridium communications project desire polar launches. Others prefer equatorial launches. Due to the wide current variance in market predictions, **the growth of the commercial market for small satellites needs to be monitored very closely so that sponsorship of needed infrastructure occurs with appropriate leadtime.**

INFRASTRUCTURE NEEDS AT ESMC

In the near term, and into the foreseeable future, the commercial ELV industry will continue to operate primarily out of ESMC. Therefore, the first priority should be to improve the existing capability of that range to handle increased launch rates. These improvements will benefit all users on the national range - large and small commercial ELV operators, NASA, and the USAF and civil government users that contract for commercial launch services.

One such improvement that will be of benefit to all users is a new USAF facility, currently in construction at the Cape, that promises to substantially reduce the turnaround problem. The Test Operations Control Center (TOCC) will provide consolidated and modernized range control, scheduling, weather and communication functions. This facility, scheduled to become operational in 1992, will enable simultaneous countdown and launch of two different vehicles. However, funding for manpower to augment current shifting restrictions needs to be provided to enable the TOCC to reach its full performance objectives.

Col. Jack Wormington, ESMC Commander, commissioned a comprehensive study to define capabilities ESMC requires to support the

U.S. space and missile programs to the year 2005. The study proceeds from the known requirements and scheduled improvements up to 1995, through the programmed requirements of 2000 and into a vision for 2005. The ESMC 2005 report is intended to be a living document to be periodically updated, and of course, funding of specific projects must have the normal higher Air Force authorities and congressional approvals.

The study has identified numerous areas in which the CCAFS needs modernization or augmentation to support anticipated launch requirements. The preliminary results of the study were shared with the committee. It is clear that ESMC has an excellent grasp of what is needed to support both government and commercial programs through this decade.

The committee concluded that the first version of ESMC 2005 represents an excellent beginning for any comprehensive infrastructure improvement program on the national ranges undertaken by the government. However, the funding requirements to support this plan considerably exceed the historic funding levels that ESMC has been given.

Commercial launch needs would be well served if the DoT could offer assistance to the Air Force in making the ESMC recommendations a reality. However, the ESMC 2005 study is far reaching, as well as complex, and for DoT support to be most effective, a close and continuing working relationship should be established between the DoT and the Air Force.

DoT should study in detail the specific commercialization projects covered by ESMC and develop cost/benefit analyses, prioritization, and a strategy for implementing these improvements into the national ranges.

DoT also needs to gain an understanding of those initiatives not specifically commercial in nature, but which will fundamentally impact all operations that use infrastructure at the Cape. Examples of projects which could potentially improve commercial launch operations are:

- Computer equipment and networks for mission planning and range safety control, including office automation and launch processing.
- Communications modernization, including digital voice systems, remote switching, improved teletype, telemetry, and remote wideband communications.
- Improved weather forecasting capability.
- A common commercial customer support facility.

VEHICLE TECHNOLOGY INFUSION

The newly issued commercial Space Launch Policy Directive addresses the technology issue and the need for reducing costs and increasing reliability of U.S. space launch vehicles, but is vague regarding actions by U.S. Government agencies awaiting guidelines to be developed by the National Space Council.

In the near future the U.S. commercial industry will have to compete against new vehicles such as the ESA Ariane 5, the PRC Long March 2E, the USSR Zenit, and the Japanese H-2, whose developments are completely paid for by national funding. No such new vehicle is currently planned in the United States. As a result there is an urgent near-term need to infuse advanced technology into the U.S. launch vehicles to strengthen competitiveness. Without such vehicle technology improvements, there is little chance to remain competitive against such new vehicles, regardless of investments in infrastructure. Further, there is a long-term need for new U.S. launch vehicles.

The Commercial Space Launch Act Amendment of 1988 called for NASA to develop a Component Technology Plan aimed at providing a mechanism to implement new technologies which will increase the competitiveness of U.S. commercial ELVs. Industry presented recommendations for specific projects yielding the highest payoff in cost, performance, and reliability. No action has been taken by NASA due to the lack of enabling legislation language in the NASA Authorization Bill.

In a similar vein, the Defense Science Board in its 1989 Summer Study of National Space Launch Strategy, was impressed by the propulsion, vehicle, and automated processing technology efforts supported by the Advanced launch System (ALS) program. The report recommends a launch vehicle strategy that continues investment in advanced propulsion and vehicle technologies and supports product improvement of current vehicles.

Strong encouragement from DoT to these other agencies on the benefits these efforts could have for the commercial space transportation industry would be helpful in overcoming the inertia involved in modernizing the nation's ELV fleet.

There are a number of other vehicle technology initiatives identified by private industry that could also significantly improve the ability for commercial ELVs to operate out of the national ranges. These technologies can be incorporated into ELVs to reduce interface requirements with the launch pads and thus reduce the strain on the entire infrastructure benefiting all operators utilizing the national range. Incorporation of these technologies into the vehicles would also improve span times from factory order to launch which would lower cost and improve competitiveness. DoT support for grants and tax incentives for private industry to help fund technologies that enhance the compatibility between launch vehicles and launch infrastructure would be very helpful. Examples of such technologies are shown below.

VEHICLE TECHNOLOGY	INFRASTRUCTURE BENEFIT
ELECTROMECHANICAL ACTUATORS & CONTROL	REPLACES COMPLEX HYDRAULIC AND PNEUMATIC SYSTEMS, REDUCING TEST AND CHECK-OUT ON PAD AS WELL AS SIMPLIFYING PAD
AUTOMATED DATA MONITORING	REDUCES MANUAL TEST AND CHECK-OUT
AUTOMATED GSE PROPELLANT LOADING & PRESSURE MONITORING	REDUCES CREW LOADING AND VEHICLE PROCESSING TIME
ADAPTIVE GUIDANCE & CONTROL	SIMPLIFIES TRAJECTORY DESIGN AND ALLOWS RELAXATION OF WEATHER CONSTRAINTS AT LAUNCH
BUILT-IN TEST CAPABILITIES	TEST REQUIREMENTS CAN BE REMOVED FROM LAUNCH INFRASTRUCTURE COMPONENT

In the long run, the need for entirely new U.S. launch vehicles must be addressed if there is to be a U.S. commercial industry.

FINANCING OPTIONS

Financing options to improve the space launch infrastructure in general, and boost the commercial launch service industry in particular, vary with respect to both viability and effectiveness. The economic viability of any option must be looked at from the government and private sector perspectives. In most cases, these two view points are necessarily the reciprocal of each other. Of the viable options, the effectiveness of the tactic will be driven by the likely rapidity and magnitude of impact that such an option would have with respect to implementing tangible improvements to the U. S. space industry. Listed below, in order of attractiveness to the private sector, are the financing options that appear to be economically viable and could initiate significant improvements in the U. S. space infrastructure.

Grants: Obviously, the granting of Federal funds for the direct improvement of national ranges is the most straight forward solution to the current situation. Such funds could be available for upgrades to existing range facilities as well as being applied to operational improvements in the existing fleet of launch vehicles. While current national budget pressures make large sums of grant money highly unlikely, modest levels of funds, provided as grants, could act as critical seed money for essential projects in facility, equipment and vehicle modernization.

Tax Credits: The use of tax credits has been proven in many industries, both in the U. S. and abroad, as an effective tool to spur private investment. Such credits could be applied to direct investment in infrastructure improvements. Additionally, and perhaps more effectively, credits could be granted for investment in research and development in new vehicle and processing techniques and technologies. By encouraging the improvement of the broader factors underlying space transportation, this type of R&D could have lasting impact in rebuilding overall U. S. space accessibility and preeminence.

A critical factor in such a strategy, however, would be the treatment of past private investment in the national ranges. Many private firms have made considerable investments in upgrading the current infrastructure, especially since the 1982 space commercialization initiative. A retroactive tax credit formula for this investment would immediately free up money for further improvements, since these funds have already been accounted for by the private firms. Some type of recognition of this previous private commitment, possibly with conditions of reinvestment of the tax benefit, is clearly an interesting option.

Tax Exemptions: Tax exempt status for bonds and other funds provided by State space agencies would increase the attractiveness of such funds for use by private firms. The tax exempt position of bonds of this nature offers the double benefit of attracting investors in the actual bond issue, because of the enhanced return on investment, while simultaneously providing lower interest rates for the bond fund user. This strategy effectively opens a pool of lower cost capital that could be applied to both new and existing space enterprises.

The difficulty with this option and the two that follow is that the principle and interest in these investments would need to be recovered in launch services prices.

Tax Deferments: Related to the core R&D described above, the use of selected tax deferments would act as a accelerating agent for the implementation of new concepts and technologies. Specifically, granting tax deferments, in the first few years of operation, for revenues generated from the launch of new vehicle configurations would enhance the early cash position of firms developing such vehicles. Deferments would help in shortening the "break even" point that companies must reach in recouping investment, while not significantly impacting the net revenues paid to the government in the total life of the program.

Government Sponsored Low Interest Loans: While not solely acting as a catalyst for new investment in the space infrastructure, the availability of low interest loans for infrastructure and vehicle improvements would be beneficial in any integrated infrastructure improvement program.

The implementation of financing and investment catalyzing options described above is essential for any significant move toward lasting improvement in the U. S. space infrastructure. Utilizing the above options, or some subset, private industry and the public sector, in partnership, can develop America's space capability for the next century.

CONCLUSIONS

Regarding ability of existing infrastructure to accommodate commercial launch requirements:

- (1) The infrastructure requirements and vehicle developments for foreign commercial competitors are being entirely underwritten by their respective governments. The intense price competition by these foreign ventures makes it imperative that the federal government directly fund improvements to the domestic space launch infrastructure and vehicle technology.

- (2) The existing infrastructure at the Eastern Space and Missile Center (ESMC) is adequate but marginal at this point in time and is antiquated and manpower intensive. The current ability of the national ranges to accommodate small ELVs is limited.
- (3) The most critical near-term infrastructure issue affecting launch through-put is the turnaround time required to reconfigure the range at ESMC. Although the real impact of delays in launch of commercial payloads has been relatively insignificant thus far, (averaging 1 1/2 days per launch) there is potential for serious schedule disruption if the Shuttle launch rate increases substantially in the future. The shortage of Air Force staffing compounds this turnaround issue and could be addressed by a relatively modest increase in budget. The new Test Operations Control Center (TOCC) will improve the situation but is undermanned for realizing its full potential.
- (4) The most visible shortcoming at the Cape, as it impacts the commercial industry, is the lack of a generic commercial customer support facility.
- (5) ESMC is aware of the problems with the existing infrastructure and has begun a comprehensive study of the potential needs. However, funding requirements for planned improvements to the existing infrastructure will substantially exceed Air Force funding levels of the past.

Regarding the desirability of a commercial spaceport:

- (1) Recent experience relative to the frequency and cost of commercial launch delays caused by interference with NASA and military launches is limited for accurate estimates to be made of the savings that might accrue by having a separate commercial spaceport. However, savings would have to be substantially higher than present data indicates for such justification.
- (2) Forecasted commercial launch demand growth for medium and large ELVs in the 1990s is insufficient to justify the construction of a new commercial spaceport at this time. Updating the ESMC infrastructure in the near term will be more beneficial to U.S. ELV competitiveness than developing a new stand-alone commercial spaceport.
- (3) Fundamental business conditions and lack of a stable national commercial space policy argue against financial participation by the commercial space industry in a new spaceport. Any additional cost pass-through to the customer that would be needed to finance a commercial spaceport is counterproductive to U.S. commercial ELV competitiveness.

- (4) Growth in the small ELV market is uncertain, but costs for developing a spaceport to accommodate these launches is much lower than for medium and large ELVs and development time is much shorter. There may be a need for multiple small ELV spaceports depending on which direction the market develops.

Regarding the ability to compete commercially:

- (1) The ability of the infrastructure to handle the existing fleet of vehicles is linked to the technology of the vehicle. Any plan to improve the national space launch infrastructure must recognize the need to improve and simplify vehicle prelaunch preparation. A number of accrued technologies are available, but are as yet unfunded.

RECOMMENDATIONS

To provide additional infrastructure useful to the commercial launch vehicle industry:

- (1) The Department of Transportation (DoT) should consider direct funding for increased range operations staffing. This funding participation should be used to enhance staffing requirements in order to alleviate the range turnaround constraint which is the major source of delays of launches of commercial spacecraft. It is estimated an increase of about 130 man years would reduce this constraint by 50%. Augmented staffing will allow the full benefits of the substantial Air Force investment in the new Test Operations Control Center to be realized.
- (2) DoT should establish a close working relationship with the Air Force to identify and evaluate the projects of the ESMC 2005 study for which DoT funding may be considered appropriate. DoT needs to urge DoD to support implementation of many of the ESMC 2005 recommendations to ensure that the total launch demands from the Cape do not impinge on the ability of the range to accommodate commercial operations in the 1990s.
- (3) DoT should arrange for a federal government grant to fund the construction of a generic commercial customer support facility. An estimate of one preliminary design is approximately \$1 Million.
- (4) DoT should study the feasibility of establishing a trust fund to finance additional commercialization projects as they become better identified. The DoT could recommend that Congress finance this trust fund through either direct tax credits on previous investment already made by industry to improve the commercial launch facilities, and/or by earmarking the taxes paid on commercial launch revenues

as they occur over the decade. The committee estimates that up to \$500 Million could be accumulated using this concept and could be directly invested to improve the nation's commercial launch infrastructure.

To evaluate the need for a commercial spaceport:

- (1) It is premature for a firm decision to be made on federal funding of a commercial spaceport for medium and large ELVs. The committee recommends that the DoT implement a program of infrastructure improvements focused on the near term and then evaluate operability as flight rates increase. Over the next 2 to 3 years, national policies regarding international competition can be evaluated. The commercial launch traffic will reach its planned near-term level, STS launch rates will be better known, and the Test Operations Control Center will be operational at ESMC. These data will enable a far better assessment of the need for a commercial spaceport for medium and large ELVs than is possible today.
- (2) DoT should closely monitor the development of small ELV markets. If it becomes clear that commercial markets will develop, competitions among interested state governments should be held with sufficient lead time to enable development of necessary infrastructure under some form of federal/state relationship.

**RECOMMENDED INFRASTRUCTURE STRATEGY
Two Phase Effort**

	NEAR TERM	LONG TERM
LARGE ELVs	Improve Existing Infrastructure Evaluate Operability Develop Future Strategy	Commercially Enhance and Improve Existing Infrastructure OR Build National Commercial Spaceport OR
SMALL ELVs	Improve Existing Infrastructure	Utilize Improved Facilities OR Small ELV Optimized Spaceport(s)

To improve the competitiveness of the commercial launch industry:

- (1) DoT should strongly encourage and support enabling legislation for NASA to implement a focused component technology plan to support existing commercial launch vehicles and for DoD to implement the Defense Science Board recommendation for pre-planned product improvements (P³I) of existing launch systems.
- (2) DoT should support grants and tax incentives and investigate the establishment of a spaceport trust fund to assist the commercial launch industry in modernizing and reducing the cost of their services. Vehicle modernization projects that improve and simplify vehicle-to-pad interfaces will reduce the demand/stress on ranges for large and medium commercial ELVs.
- (3) DOT should recognize that the planned implementation of user/licensing fees would be counterproductive to the goal of improving the U.S. ability to compete internationally in the space launch market.

AIA COMMERCIAL LAUNCH INFRASTRUCTURE STUDY

Committee Members

Chairman A.M. Lovelace - General Dynamics

Steven D. Dorfman - Hughes Aircraft
C.J. Dornbacher - McDonnell Douglas
Ronald Greenwood - GE
Robert G. Morra - Martin Marietta
Bernard P. Randolph - TRW

Working Group Members

Chairman: Lee R. Scherer - Consultant

Fran Clements - Hughes Aircraft
Ted Johnston - General Dynamics
Steve Malyszka - GE
Roger Rushe - TRW
Edwin Sparhawk - Martin Marietta
Ken Young - McDonnell Douglas

Mr. NELSON. Now, panel one. We are delighted to have the General Counsel of NASA, Ed Frankle. We are delighted to have the Deputy Assistant Secretary of the Air Force, Dick McCormick. Both, in their own right, well-respected professionals in this area of space. So let me turn to you, Ed, first. We will hear your statements, and then we'll turn to Dick, and then we'll get on into the questions.

STATEMENTS OF EDWARD A. FRANKLE, GENERAL COUNSEL, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION; AND RICHARD M. McCORMICK, DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE (SPACE PLANS AND POLICY), DEPARTMENT OF DEFENSE; ACCOMPANIED BY COL. JACK WORMINGTON, USAF, EASTERN SPACE AND MISSILE CENTER COMMANDER

Mr. FRANKLE. Thank you, Mr. Chairman. I am delighted to be here, Mr. Walker.

I have a whole statement, which I would like to have in the record, but with your leave, I would like to summarize it in a few minutes, and then I'll be free to take questions.

Mr. Chairman, I appreciate the opportunity to appear before you today to provide an update on NASA's efforts to encourage and facilitate the commercial space launch industry.

As I stated last year in our testimony, the transition from total reliance on the space shuttle to implementation of a mixed fleet launch strategy is an evolutionary process. We have come a long way and we have evolved a lot in the last year. NASA continues to support the growth and viability of a domestic launch industry in two main areas: one, as a provider of NASA property and services to the industry on a noninterference, cost-reimbursable basis, and second, as a purchaser of launch services in a manner consistent with policy and law and within the budgetary constraints which are applicable to all Federal agencies.

Before I highlight NASA's specific actions regarding support of the emerging launch industry, I would like to express the agency's support of the subcommittee's efforts which resulted in the passage of the Space Launch Purchases Act of 1980-1990. This Act codifies the procurement practices and policies that have been adopted by NASA to accommodate our transition to the purchase of launch services, and which have been developed in consultation with industry and congressional sources and other agencies. I will describe them in more detail later in my statement.

With respect to the first of those two areas of support, we are providing property and services to industry. To date, NASA has consummated seven headquarters level authorizing Commercial Space Launch Act agreements with industry. Two of them are being updated to ensure consistency with the model terms and conditions, our model agreements which we have worked out with industry. Three additional such agreements are currently under review. In addition, we have nine field center subagreements for specific support that are being implemented and four more of those agreements are now under review. So we have been very active in supporting the industry with NASA property and services.

But, besides that, we also are a user of the industry. Now each of the payloads that we're going to be launching is reviewed by a NASA Flight Assignments Board, which was established in 1989. The payload assignment process of the Flight Assignment Board states that primary payloads are assigned for a launch on an ELV unless manned presence is required, the unique capabilities of the space shuttle are required, and/or other compelling circumstances warrant the use of the space shuttle. These criteria are completely consistent with the National Space Policy and the Space Shuttle Use Policy described in section 112 of NASA's Authorization Act of 1991.

Last year we reported that we had awarded two launch service contracts to General Dynamics. We have since awarded three additional launch service contracts for a total of 24 potential launches. These launches include the award of the Mars Observer launch to Martin Marietta, a series of 15 medium class ELVs, our MELV contract, with three firm launches and 12 options—that was to McDonnell Douglas—and we selected General Dynamics to launch the SOHO mission.

Fifteen of the 23 missions that NASA has scheduled for launch on ELVs through 1995 are being procured under launch service contracts, similar to the CRRES contract, which incorporate terms and conditions consistent with the recent legislation. Of the eight remaining missions, five spacecraft require Atlas-E, Titan II or Titan IV boosters, which are currently only available from the DOD, and one spacecraft, the Extreme Ultraviolet Explorer, will be launched on a U.S. Air Force Delta II in 1991. Two of the spacecraft will be launched on NASA's remaining Scout vehicles.

I am pleased to report that the much discussed Small Class ELV procurement remains on target for award in early 1991. This contract anticipates ten more commercial launch services, launches, with seven of them being firm and three options. This launch service solicitation has resulted in intense competition among potential providers, which is a first in our procurement for these series of launches, and we're delighted about that. I would also like to add that, in accordance with NASA's approach to the acquisition of ELV launch services in a commercially reasonable manner, detailed specifications were not used and certification of cost or pricing data were not required as a precondition to submitting a proposal.

This illustrates that we have evolved innovative contracting approaches which emulate good, commercial contracting practices, while retaining some traditional Government contracting practices, where industry has expressed a preference for their retention, or where they are required by law, or they just make good sense.

For example, NASA acquires ELV services, not vehicles, under firm fixed price contracts in quantities large enough to serve as a reasonable business base for the industry, without the use of any milspecs, fedspecs, or any other detailed specifications, without certification of cost or pricing data as a precondition to proposal, in a manner which allows offerors to propose their own unique and creative approach to managing, producing, and ensuring the quality of their product, and with reduced NASA oversight, and use of indus-

try proposed risk management provisions, such as reciprocal liquidated damages.

At the same time, we have retained some traditional Government contracting practices, such as the right to protest and the use of administrative disputes procedures to resolve disagreements, where industry has indicated a clear desire to retain such practices. The result has been a flexible, commercially reasonable process which not only has accommodated the changes necessary to permit a switch to the use of launch services, but has also allowed NASA to fulfill its obligations to the taxpayer and the Congress.

We have achieved these goals by retaining sufficient insight to a launch service contractor's activities to ensure that we are making a wise, programmatic decision when we contract to launch payloads that are often worth hundreds of millions of tax dollars. At the same time, we have gone to great lengths to minimize the intrusiveness of these insight rights by utilizing and relying on the contractor's own procedures and information almost exclusively. In this way, we have achieved the dual goals of promoting an individualized and efficient commercial-space launch industry while protecting not only the public's investment in payloads and launch ranges, but also the public health and safety.

As an example of how some of these more unique provisions are working, we are seeing some of the provisions already starting to work. For instance, we have signed a launch service contract which provides for reciprocal liquidated damages for Government caused launch delays. We have, in fact, already paid monetary compensation to a launch service contractor when technical problems delayed the availability of a developmental spacecraft for launch. I'm talking about the GOES series, which has been moved into '92.

We worry that, although positive steps have been taken to define and institute this mixed fleet launch strategy, budgetary constraints on both civilian spacecraft and launch vehicle programs will likely constrain our ability to exercise the options that we have under the MELV and the SELV contracts. In the future, we do have plans for some new procurements, such as the Advanced Tracking and Data Relay System (the ATDRS) the Mobile Satellite, and the Lunar Observer missions. In addition, we plan to purchase data from a commercially-developed Sea Wide Field Sensor, or SEAWIFS. I think we can guarantee you that we are going to craft the procurement strategy for each of those, particularized on the needs that we have and the program has, and that you will see procurement approaches in these that vary quite dramatically, and in an effort to give the industry as much leeway as is reasonably possible.

In addition to supporting and using the launch industry, we also know that the status quo can and needs to be improved. In July, 1990, we submitted to the Congress an Expendable Launch Vehicle Technology Report. Although funding hasn't—which was worked out, by the way, in consultation with industry and the Department of Transportation and the COMSTAC. Although funding has not been appropriated to implement that specific ELV technology initiative, our ongoing work at the component and subsystem level in several areas, particularly propulsion, as well as the NASA/DOD

advanced launch system development activity, will continue to serve as a primary source for advanced launch vehicle technology.

We also work with industry to identify and implement performance and technology enhancements on NASA missions, where appropriate, and very often those improvements will apply to other missions besides NASA and, therefore, help the industry. Examples are the development of a 10-foot payload fairing for the launch of the Roentgen Satellite (ROSAT) on a Delta in June of 1990; modifications which transform to the NASA Atlas-G/Centaur vehicle into the commercial Atlas I, which was flown for the first time in support of the CRRES mission; additional enhancements and upgrades to the Atlas IIAS in support of the Solar Heliospheric Satellite, which is SOHO, I mentioned earlier; and the implementation of a west coast Delta II launch capability to support NASA science missions and commercial launches requiring polar orbit. These enhancements were initiated to support NASA mission objectives, but have resulted in positive benefits to the industry and its increased ability to compete internationally.

Mr. Chairman, NASA is also beyond those kind of things, undertaking a clearinghouse activity which—this is really not a big program; it doesn't cost money. But I think it shows how we're trying to be flexible in the approach to the industry. This is a clearinghouse activity where we are identifying small commercial experiments and instruments from the industry. We're just taking information from them. We're assembling them into groups that could be aggregated for launch on commercial SELVs and sending that information out to the launch contractors, hoping that sort of a—it's almost like a dating system. We're trying to put out what the requirements are and give it to the people who can meet them, and let them work out their own deals. We are providing a centralized place where information can be put together and it's up to them, the domestic suppliers, to consummate deals.

In a final note, NASA commends and supports the subcommittee's recent expansion of the Commercial Space Launch Act to make possible a more active role for State governments in the facilitation of space commercialization. State involvement directed toward the augmentation of the existing infrastructure could benefit greatly both the commercial and Government launches as the domestic launch industry grows to meet the needs of the 21st century.

Mr. Chairman, that concludes my summary of the statement. I would just like to say that I and we at NASA have enjoyed working with you over the years, and we wish you well in your future.

Thank you very much.

[The prepared statement of Edward A. Frankle follows:]



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November 30, 1990

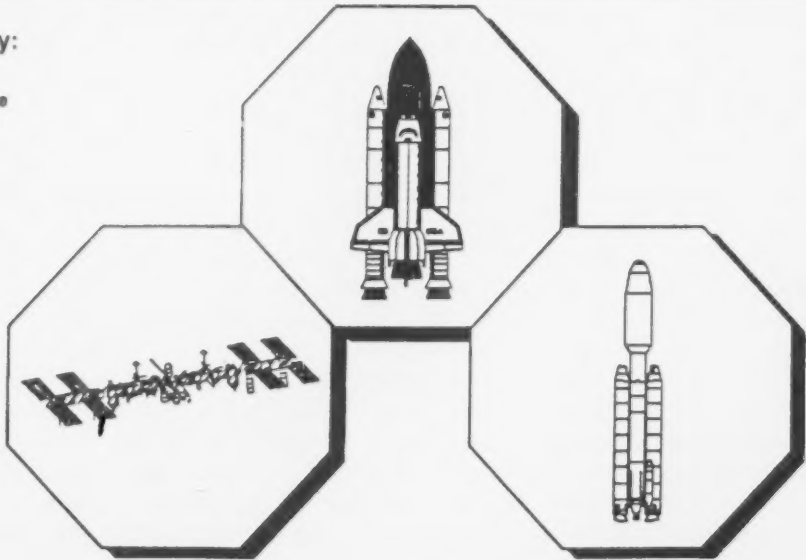
Subcommittee on Space Science and Applications

Committee on Science, Space, and Technology

House of Representatives

Statement by:

Edward A. Frankie
General Counsel



101st Congress

Statement of
Edward Frankle
General Counsel

National Aeronautics and Space Administration
before the
Subcommittee on Space Science and Applications
Committee on Science, Space, and Technology
House of Representatives

Mr. Chairman and Members of the Subcommittee:

I appreciate the opportunity to appear before you today to provide an update on NASA's activities to encourage and facilitate the commercial space launch industry.

As stated in our testimony to this Subcommittee last year, the transition from total reliance on the Space Shuttle to implementation of a mixed fleet launch strategy is an evolutionary process. NASA continues to support the growth and viability of a robust domestic launch industry in two arenas: (1) as a provider of NASA property and services to the industry on a noninterference cost reimbursable basis and (2) as a procurer of launch services in a manner consistent with policy and law and within budgetary constraints.

Before I highlight some of NASA's specific actions regarding support of the emerging launch industry, I would like to express the Agency's support for the Subcommittee's efforts which resulted in the passage of the Space Launch Purchases Act of 1990. This Act codifies the procurement policies and practices that have been adopted by NASA to accommodate our transition to the purchase of launch services. Since NASA and Department of Defense (DOD) launches are predominant users of domestic launch services, interest and emphasis has been placed on the process of refining federal procurement policy and law for effective launch service solicitations for government launches procured from the commercial sector. This has been a challenging and issue-laden endeavor. We feel that the two procurement symposia we sponsored in the summer of 1989 allowed for open and meaningful discussions between industry, congressional representatives and the affected agencies.

NASA has found that these open meetings with industry are an excellent forum to convey information and to afford an immediate opportunity for feedback from the industry. Accordingly, on May 9, 1990, NASA and the DOD jointly sponsored a public symposium at KSC where the policy and process whereby commercial operators may gain access to government property and services, as well as the manner in which each organization planned to exercise oversight for government missions utilizing launch services, were clarified. Copies of both NASA and DOD model agreements were discussed and made available to the public. Consistent with the Commercial Space Launch Act (CSLA), as amended, NASA and DOD have evolved into a consistent direct

cost pricing policy for government services and explained this policy to industry at the symposium.

To date NASA has consummated seven Headquarters level authorizing CSLA Agreements with industry, two of which are being updated to ensure consistency with the model terms and conditions (SSI and Conatec). Three additional CSLA Agreements are currently under review. In addition nine field center subagreements for specific support are being implemented with four more Subagreements under active discussion. The entire CSLA agreement implementation and review process has been significantly shortened with the establishment of model agreements and subagreements, information exchanged at the 1990 Commercial Use Symposium, and identification of points-of-contact at each NASA center.

Besides making NASA property and services accessible to the commercial space industry by way of agreements, we also are a user of the industry. Each of our payloads is now reviewed by the NASA Flight Assignment Board (FAB), established in 1989. This board which assigns civil government spacecraft to launch on either an ELV or the Space Shuttle, is an effective and useful mechanism for ensuring that we are making appropriate use of the private sector launch industry. The FAB payload assignment criteria state that primary payloads will be assigned for launch on an ELV unless: manned presence is required, the unique capabilities of the Space Shuttle are required, and/or other compelling circumstances warrant use of the Space Shuttle. These criteria are completely consistent with National Space Policy and the Space Shuttle Use Policy described in Section 112 of the NASA Authorization Act of 1991.

Last year we reported award of two launch service contracts to General Dynamics; one for the launch of the series of five GOES missions and one for the CRRES mission. CRRES, procured via a barter exchange of residual flight hardware for a launch service, was successfully launched last summer. We have since selected three additional launch service contractors for a total of 24 potential launches. These include award of the Mars Observer launch to Martin Marietta, the series of 15 medium class ELV (MELV) launches (3 firm, 12 optional) to McDonnell Douglas, and selection of General Dynamics to launch the SOHO mission.

Fifteen of the twenty-three missions NASA has scheduled for launch on ELV's through 1995 are being procured under launch service contracts, similar to the CRRES contract, which incorporate terms and conditions consistent with the recent legislation. Of the eight remaining missions; five spacecraft require Atlas-E, Titan II and Titan IV boosters, which are currently only available from the DOD; one spacecraft, the Extreme Ultraviolet Explorer (EUVE), will be launched on a USAF Delta II in 1991; and two spacecraft will be launched on NASA's remaining Scout launch vehicles.

I am pleased to report that the much discussed Small Class ELV (SELV) procurement remains on target for contract award in early 1991. The SELV launch service procurement anticipates 10 launches, seven firm and three options. This launch service solicitation has resulted in intense competition among potential providers. I would also like to add that, in accordance with NASA's approach to the acquisition of ELV launch services in a commercially reasonable manner, detailed specifications were not

used and certification of cost or pricing data were not required as a precondition to submitting a proposal.

This continues NASA's successful efforts to develop contracting procedures to acquire ELV services in a commercially reasonable manner. Working together with industry to identify and resolve problem areas, NASA has evolved innovative contracting approaches which emulate good commercial contracting practices while retaining some traditional Government contracting practices where industry has expressed a preference for their retention.

For example; NASA acquires ELV services (not launch vehicles) under firm fixed price contracts; in quantities large enough to serve as a reasonable business base; without the use of any MilSpecs, FedSpecs, or any other detailed specifications; without certification of cost or pricing data as a precondition to proposal; in a manner which allows offerors to propose their own unique and creative approach to managing, producing, and ensuring the quality of their product; with reduced NASA oversight; and using such industry-proposed risk management provisions as reciprocal liquidated damages.

At the same time we have retained some traditional Government contracting practices, such as the right to protest and the use of administrative disputes procedures to resolve disagreements, where industry has indicated a clear desire to retain such practices. The result has been a flexible, commercially reasonable process which not only has accommodated the changes necessary to permit a switch to the use of launch services but has also allowed NASA to fulfill its obligations to the taxpayer and the Congress.

We have achieved these latter goals by retaining sufficient insight to a launch service contractor's activities to insure that we are making a wise programmatic decision when we contract to launch payloads that are often worth hundreds of millions of tax dollars. At the same time, we have gone to great lengths to minimize the intrusiveness of these insight rights by utilizing and relying on the contractor's own procedures and information almost exclusively. In this way we have achieved the dual goals of promoting an individualized and efficient commercial space launch industry while still protecting not only the public's investment in payloads and launch ranges but also the public health and safety.

We have procured MELV launch services in a large enough quantity that the benefits of a sustained production line are reducing our launch costs. We hope, the SELV acquisition now in process will also produce significant cost reductions based on similar quantity related production efficiencies. At the same time, we see some of the contracting procedures developed in coordination with industry starting to work. For instance, we have already signed a launch service contract that provided for reciprocal liquidated damages for Government caused launch delays. We have, in fact, already paid monetary compensation to a launch service contractor when technical problems delayed availability of a developmental spacecraft for launch. The shift to acquisition of launch services and use of commercial practices will continue, and we intend to continue to learn better and more efficient ways to acquire these services as we gain more experience.

Although positive steps have been taken to define and institute a Mixed Fleet Launch Strategy, budgetary constraints on both civilian spacecraft and launch vehicle programs will likely constrain NASA's ability to exercise the options under the MELV and SELV contracts, as well as reduce the likelihood of additional launch service solicitations in the near future. Anticipated procurement actions in the near term are limited to launch services to support the Advanced Tracking and Data Relay System (ATDRS), Mobile Satellite (MSAT), and Lunar Observer missions. In addition, NASA plans to purchase data from a commercially developed Sea Wide Field Sensor (SEAWIFS), rather than a spacecraft or launch, from a competitively selected commercial entity. In all cases we are looking at the needs of each program to craft an acquisition approach driven by program requirements rather than by past practice. I would not be surprised if the procurement approaches to these different programs were widely varied.

In addition to supporting and using the domestic launch services industry, we also know that the status quo can be improved. In July 1990, NASA submitted an Expendable Launch Vehicle Technology Report to Congress on options to perform research on technologies to reduce costs, increase reliability, and improve performance of ELV's for both government and commercial missions. Although funding has not been appropriated to implement a specific ELV technology initiative, NASA's ongoing work at the component and subsystem level in several areas, particularly propulsion, as well as the NASA/DOD Advanced Launch Development activity, will continue to serve as a primary source of launch vehicle technology.

In addition, NASA continues to work with the industry to identify and implement performance/technology enhancements on NASA missions where appropriate and within available funding allocations. Examples of this type of activity include the following: (a) development of a 10-foot payload fairing for launch of the Roentgen Satellite (ROSAT) on a Delta in June 1990; (b) modifications transforming the NASA Atlas-G/Centaur vehicle into the commercial Atlas I, flown for the first time in support of the NASA/USAF Combined Release and Radiation Effects Satellite (CRRES) in July 1990; (c) additional enhancements and upgrades to the Atlas IIAS in support of the Solar Heliospheric Satellite (SOHO) in July 1995; and (d) implementing a west coast Delta II launch capability to support both NASA science missions and commercial launches. These types of enhancements were initiated to support NASA mission objectives, but have resulted in positive benefits to the launch industry and its increased ability to compete internationally.

Much has been achieved in the years since the passage of the CSLA in 1984. NASA will continue to work with other affected federal agencies and the industry to encourage the growth of the domestic commercial launch sector in an increasingly competitive international market where worldwide supply of launch services continues to exceed demand. In an effort to encourage growth of the commercial SELV market, NASA is also undertaking a clearinghouse activity that identifies small commercial experiments, instruments, and spacecraft that could be aggregated for launch on a commercial SELV or flown as a piggyback payload on a larger commercial ELV. Once the potential users of SELV launches are identified, it will be up to the domestic suppliers to consummate necessary contracts.

In a final note, NASA commends and supports the Subcommittee's recent expansion of the CSLA to make possible a more active role for state governments in the facilitation of space commercialization. State involvement directed toward augmentation of existing launch infrastructure could benefit both the commercial and government launches as the domestic launch industry grows to meet the needs of the 21st century. Thank you for the opportunity to update the Subcommittee on NASA's activities involving support to this industry. I will be pleased to respond to your questions.

Mr. NELSON. Thank you.

Mr. McCormick.

Mr. McCORMICK. Thank you, Mr. Chairman, Congressman Walker.

I am nursing a cold, so I'll try not to sound like I'm going through adolescence here.

Mr. Chairman, members of the committee, DOD is pleased with the opportunity to be here today to emphasize once again our support for the commercial launch industry. I have a short statement that I would like to read before taking your questions, essentially to say that we have been quite active in the commercial space arena since your hearing last November, both from a policy and an operational perspective.

In addition to our participation with the National Space Council, which culminated in the President's commercial space launch policy on September 5th, let me mention just a few other significant examples of our activities.

First, in the operations area, I believe the strong DOD support to the commercial launch industry is exemplified by the actions of the outstanding and dedicated people here at the Cape. These people have been instrumental in balancing national security launch requirements against those of commercial operators to maximize the use of our overburdened launch facilities.

For example, at the beginning of the year, we projected that only ten Delta launches could be achieved from the Cape. I am pleased to say that we have already conducted those ten launches successfully and fully expect to see two more, thus exceeding our initial projections by 20 percent. This increased launch rate is indicative of our desire to enhance the competitive position of U.S. commercial launch operations in the world market with full recognition that commercial launches can be manifested and launched with confidence in the United States.

This same enthusiasm is present on the Titan side, where our people worked numerous extra shifts during the holiday period last year to launch the first commercial Titan vehicle. Yet, some people may think this was a short-term surge. However, our permanent commitment is constantly demonstrated. We are, right now, doing everything reasonable to complete Launch Complex 40 modifications, which is the Titan vehicle complex, in time to support the time sensitive launch operations of both commercial and Government.

In addition to the Launch Complex 40 activity which, by the way, was redesigned to meet the needs of both the Air Force and the commercial launch operators, a number of other infrastructure improvements are in work. This concentrated effort to expand and modernize our ELV facilities and support equipment is a result of not having made similar investments in the early to mid-Eighties. At that time, it made sense to limit our ELV capital investments, since most DOD and all commercial payloads were going to fly on the shuttle. ELV capacity was not an issue. Essentially, our goal at that time was to only maintain an austere backup ELV capability for our most critical payloads. Now the situation has clearly changed. We and the commercial space sector use ELVs extensive-

ly and we, therefore, must enhance our launch support capabilities where we can achieve cost-effective benefits.

For instance, the Eastern Test Range recently installed new telemetry receivers, which not only can be used for DOD operations, but also are tailored to accommodate commercial launch operations in a new frequency band designated specifically for that use.

Other near-term additions include the Test Operations Control Center and expansion of Atlas and Delta vehicle processing facilities, all here at the Cape. The Test Operations Control Center will, for the first time, provide ESMC the capability to perform simultaneous range operations on two different vehicles, reduce communications reconfiguration from what now can take up to three days in the Range Control Center to one hour, and improve the efficiency, speed and reliability of the range safety display system. These improvements are critical in reducing range turnaround time.

The Atlas processing facilities will increase vehicle throughput. General Dynamics is privately developing this capability at the Cape on an outlease of land from the Air Force.

With regard to Delta, the Air Force is developing a facility to perform second stage high pressure and solid rocket motor leak tests, in addition to the pad modifications to accommodate the new graphite epoxy motors.

These types of programs will both lower cost and improve operational flexibility, critical items to both the DOD and commercial operators.

In addition to supporting long time operations at the Cape, we are also assisting a number of new ventures. This year, we signed a range use agreement with Astrotech to support their operations, and have refurbished Launch Complex 20, which Space Data Division is using in their Joust program. One other action we have initiated is to develop a new cost estimating and billing system to simplify financial management for all range users.

Besides the support we have provided on the east coast, we also helped the American Rocket Company by furnishing an engine test stand at Edwards Air Force Base and a launch pad at Vandenberg Air Force Base. In all cases, the specific needs of commercial operations are being factored into our plans, operations concepts, and facility designs.

With similar objectives in mind, the Spaceport Florida Authority has asked us to examine the possibility of joining with them to address other needed improvements in ESMC launch processing, checkout and control facilities, and physical plant. These enhancements would be sited and designed for use by DOD and commercial operators alike.

Among other efforts, we are assisting the Spaceport Florida Authority in preparing the necessary environmental documentation and obtaining required Government approvals to conduct small rocket launches from Cape San Blas at Eglin Air Force Base. In support of this activity, we allowed Spaceport Florida Authority personnel to participate in the Air Force sponsored "operations training course" at ESMC, which is our means of training, qualifying and certifying people to safely launch small sounding rockets. The Spaceport Florida Authority was thus able to save the time and money from otherwise having to do this independently.

While the DOD has and must continue to support operational improvements in our launch capabilities, we are also committed to instituting the most practical, cost-effective and success-oriented launch vehicle procurement strategies. We believe that a range of space launch support options is required to address the wide spectrum of Government missions, that the degree of Government involvement should be determined on a basis of both mission criticality and cost, and that the application of commercially reasonable procurement practices to any procurement strategy ranges from total commercial practices with no Government involvement at one extreme, to Government control at the other extreme.

Let me assure you, the DOD is at the forefront of defining and implementing new methods for acquiring commercial products, and fully understands the need to continue this approach to the degree that mission needs permit. It was this philosophy, and the successful use of a variety of commercial procurement practices in our medium launch vehicle I and II acquisitions, that allowed us to make further advances in applying commercial principles to our ongoing Air Force small launch vehicle and MLV III procurements. The small launch vehicle contract, which is a service contract, provides for one launch in 1991 and two thereafter. We are presently in source selection on this contract and expect award soon.

The MLV III request for proposal is scheduled for release next summer, with contract award late next year. We plan to buy four launches per year under this contract, with a scheduled first launch in the late '95 time frame.

I would like to close by saying that we want to see success and growth in the commercial space launch industry. The expanded industrial base will only serve to enhance DOD options and realize potential cost savings. A robust commercial launch industry built on this industrial base can truly lead to a greater partnership, where all space sectors benefit.

DOD will continue to make investments in launch systems and infrastructure to satisfy our mission needs. Without this investment in our Nation's launch future, commercial gains would be on the margin and we would continue to suffer system inefficiencies, never realizing the advantages newer technology will bring in modernized infrastructure, and a new generation of space launch vehicles provide the path to the future.

Our Advanced Launch Development Program is the first step along that path to the future. The Advanced Launch Development Program technology supports the future development of a launch capability which will be more responsive, reliable, and significantly less costly than current boosters. We need such a system to enable U.S. commercial providers to compete effectively in the international marketplace, and also meet civil and national security requirements. Acquiring such a launch capability will require a national commitment focused on a family of vehicles that meet the mission requirements of all users. The DOD stands ready to address this national commitment with NASA, the other concerned agencies, industry and the Congress.

Mr. Chairman, I thank you for the time to present these opening remarks, and I look forward to your questions.

[The prepared statement of Richard McCormick follows:]

REMARKS

BY

MR. RICHARD M. McCORMICK

DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE

(SPACE PLANS AND POLICY)

TO

HOUSE OF REPRESENTATIVES

SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS

(CHAIRMAN: THE HONORABLE BILL NELSON)

30 NOVEMBER 1990

KENNEDY SPACE CENTER, FLORIDA

OPENING REMARKS

BY

MR RICHARD M. McCORMICK
DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE
(SPACE PLANS AND POLICY)

MR CHAIRMAN, MEMBERS OF THE COMMITTEE, DoD IS PLEASED WITH THE OPPORTUNITY TO BE HERE TODAY TO EMPHASIZE, ONCE AGAIN, OUR SUPPORT FOR THE COMMERCIAL SPACE LAUNCH INDUSTRY. I HAVE A SHORT STATEMENT THAT I WOULD LIKE TO READ BEFORE TAKING YOUR QUESTIONS -- ESSENTIALLY TO SAY THAT WE HAVE BEEN QUITE ACTIVE IN THE COMMERCIAL SPACE ARENA SINCE YOUR HEARING LAST NOVEMBER -- BOTH FROM A POLICY AND AN OPERATIONAL PERSPECTIVE.

IN ADDITION TO OUR PARTICIPATION WITH THE NATIONAL SPACE COUNCIL, WHICH CULMINATED IN THE PRESIDENT'S COMMERCIAL SPACE LAUNCH POLICY ON SEPTEMBER FIFTH, LET ME MENTION JUST A FEW OTHER SIGNIFICANT EXAMPLES OF OUR ACTIVITIES. FIRST, IN THE OPERATIONS AREA, I BELIEVE THE STRONG DoD SUPPORT TO THE COMMERCIAL LAUNCH INDUSTRY IS EXEMPLIFIED BY THE ACTIONS OF THE OUTSTANDING AND DEDICATED PEOPLE AT THE CAPE. THESE PEOPLE HAVE BEEN INSTRUMENTAL IN BALANCING NATIONAL SECURITY LAUNCH REQUIREMENTS AGAINST THOSE OF COMMERCIAL OPERATORS TO MAXIMIZE THE USE OF OUR OVERBURDENED LAUNCH FACILITIES. FOR EXAMPLE, AT THE BEGINNING OF THE YEAR, WE PROJECTED THAT ONLY 10 DELTA LAUNCHES COULD BE ACHIEVED FROM THE CAPE. I'M PLEASED TO SAY THAT WE HAVE ALREADY CONDUCTED THOSE 10 LAUNCHES SUCCESSFULLY AND FULLY EXPECT TO SEE 20 MORE, THUS EXCEEDING OUR INITIAL PROJECTIONS BY 20 PERCENT. THIS INCREASED LAUNCH RATE IS INDICATIVE OF

OUR DESIRE TO ENHANCE THE COMPETITIVE POSITION OF U.S. COMMERCIAL LAUNCH OPERATORS IN THE WORLD MARKET WITH FULL RECOGNITION THAT COMMERCIAL LAUNCHES CAN BE MANIFESTED AND LAUNCHED WITH CONFIDENCE IN THE U.S. THIS SAME ENTHUSIASM IS PRESENT ON THE TITAN SIDE, WHERE OUR PEOPLE WORKED NUMEROUS EXTRA SHIFTS DURING THE HOLIDAY PERIOD LAST YEAR TO LAUNCH THE FIRST COMMERCIAL TITAN VEHICLE. SOME PEOPLE MAY THINK THIS WAS A SHORT TERM SURGE. YET, OUR PERMANENT COMMITMENT IS CONSTANTLY DEMONSTRATED -- WE ARE, RIGHT NOW, DOING EVERYTHING REASONABLE TO COMPLETE LAUNCH COMPLEX 40 MODIFICATIONS IN TIME TO SUPPORT TIME SENSITIVE LAUNCH OPERATIONS -- BOTH COMMERCIAL AND GOVERNMENT.

IN ADDITION TO THE LAUNCH COMPLEX 40 ACTIVITY, WHICH, BY THE WAY, WAS REDESIGNED TO MEET THE NEEDS OF BOTH THE AIR FORCE AND COMMERCIAL LAUNCH OPERATIONS, A NUMBER OF OTHER INFRASTRUCTURE IMPROVEMENTS ARE IN WORK. THIS CONCENTRATED EFFORT TO EXPAND AND MODERNIZE OUR ELV FACILITIES AND SUPPORT EQUIPMENT IS A RESULT OF NOT HAVING MADE SIMILAR INVESTMENTS IN THE EARLY TO MID EIGHTIES. AT THAT TIME, IT MADE SENSE TO LIMIT OUR ELV CAPITAL INVESTMENTS, SINCE MOST DoD AND ALL COMMERCIAL PAYLOADS WERE GOING TO FLY ON THE SHUTTLE. ELV CAPACITY WAS NOT AN ISSUE. ESSENTIALLY, OUR GOAL AT THAT TIME WAS TO ONLY MAINTAIN AN AUSTERE BACK-UP ELV CAPABILITY FOR OUR MOST CRITICAL PAYLOADS. NOW, THE SITUATION HAS CLEARLY CHANGED. WE, AND THE COMMERCIAL SPACE SECTOR USE ELV'S EXTENSIVELY, AND WE THEREFORE MUST ENHANCE OUR LAUNCH SUPPORT CAPABILITIES WHERE WE CAN ACHIEVE COST-EFFECTIVE BENEFITS.

FOR INSTANCE, THE EASTERN TEST RANGE RECENTLY INSTALLED NEW TELEMETRY RECEIVERS, WHICH NOT ONLY CAN BE USED FOR DoD OPERATIONS, BUT ALSO ARE TAILORED TO ACCOMMODATE COMMERCIAL LAUNCH OPERATIONS IN A NEW

FREQUENCY BAND DESIGNATED FOR THAT USE. OTHER NEAR TERM ADDITIONS INCLUDE THE TEST OPERATIONS CONTROL CENTER AND EXPANSION OF ATLAS AND DELTA VEHICLE PROCESSING FACILITIES, ALL HERE AT THE CAPE. THE TEST OPERATIONS CONTROL CENTER WILL, FOR THE FIRST TIME, PROVIDE ESMC THE CAPABILITY TO PERFORM SIMULTANEOUS RANGE OPERATIONS ON TWO DIFFERENT VEHICLES, REDUCE COMMUNICATIONS RECONFIGURATION FROM WHAT NOW CAN TAKE UP TO THREE DAYS IN THE RANGE CONTROL CENTER, TO ONE HOUR, AND IMPROVE THE EFFICIENCY, SPEED AND RELIABILITY OF THE RANGE SAFETY DISPLAY SYSTEM. THESE IMPROVEMENTS ARE CRITICAL IN REDUCING RANGE TURNAROUND TIME. THE ATLAS PROCESSING FACILITIES WILL INCREASE VEHICLE THROUGHPUT. GENERAL DYNAMICS IS PRIVATELY DEVELOPING THIS CAPABILITY AT THE CAPE, ON AN OUTLEASE OF LAND FROM THE AIR FORCE. WITH REGARD TO DELTA, THE AIR FORCE IS DEVELOPING A FACILITY TO PERFORM SECOND STAGE HIGH PRESSURE AND SOLID ROCKET MOTOR LEAK TESTS, IN ADDITION TO THE PAD MODIFICATIONS TO ACCOMMODATE THE NEW GRAPHITE EPOXY MOTORS. THESE TYPES OF PROGRAMS WILL BOTH LOWER COST AND IMPROVE OPERATIONAL FLEXIBILITY, CRITICAL ITEMS TO BOTH THE DoD AND COMMERCIAL OPERATORS. IN ADDITION TO SUPPORTING LONG TIME OPERATORS AT THE CAPE, WE ARE ALSO ASSISTING A NUMBER OF NEW VENTURES. THIS YEAR, WE SIGNED A RANGE USE AGREEMENT WITH ASTROTECH TO SUPPORT THEIR OPERATIONS, AND HAVE REFURBISHED LAUNCH COMPLEX 20, WHICH SPACE DATA DIVISION IS USING IN THEIR JOUST PROGRAM. ONE OTHER ACTION WE HAVE INITIATED IS TO DEVELOP A NEW COST ESTIMATING AND BILLING SYSTEM TO SIMPLIFY FINANCIAL MANAGEMENT FOR ALL RANGE USERS. BESIDES THE SUPPORT WE HAVE PROVIDED ON THE EAST COAST, WE ALSO HELPED THE AMERICAN ROCKET COMPANY BY FURNISHING AN ENGINE TEST STAND AT EDWARDS AFB AND A LAUNCH PAD AT VANDENBERG AFB. IN ALL CASES, THE SPECIFIC NEEDS OF COMMERCIAL OPERATIONS ARE BEING FACTORED INTO OUR PLANS, OPERATIONS CONCEPTS, AND FACILITY DESIGNS.

WITH SIMILAR OBJECTIVES IN MIND, THE SPACEPORT FLORIDA AUTHORITY HAS ASKED US TO EXAMINE THE POSSIBILITY OF JOINING WITH THEM TO ADDRESS OTHER NEEDED IMPROVEMENTS IN ESMC LAUNCH PROCESSING, CHECKOUT AND CONTROL FACILITIES, AND PHYSICAL PLANT. THESE ENHANCEMENTS WOULD BE SITED AND DESIGNED FOR USE BY DoD AND COMMERCIAL OPERATORS ALIKE. AMONG OTHER EFFORTS, WE ARE ASSISTING THE SPACEPORT FLORIDA AUTHORITY IN PREPARING THE NECESSARY ENVIRONMENTAL DOCUMENTATION AND OBTAINING REQUIRED GOVERNMENT APPROVALS, TO CONDUCT SMALL ROCKET LAUNCHES FROM CAPE SAN BLAS AT EGLIN AFB. IN SUPPORT OF THIS ACTIVITY, WE ALLOWED SPACEPORT FLORIDA AUTHORITY PERSONNEL TO PARTICIPATE IN THE AIR FORCE SPONSORED "OPERATORS TRAINING COURSE" AT ESMC, WHICH IS OUR MEANS FOR TRAINING, QUALIFYING, AND CERTIFYING PEOPLE TO SAFELY LAUNCH SMALL SOUNDING ROCKETS. THE SPACEPORT FLORIDA AUTHORITY WAS THUS ABLE TO SAVE THE TIME AND MONEY FROM OTHERWISE HAVING TO DO THIS INDEPENDENTLY.

WHILE THE DoD HAS, AND MUST CONTINUE, TO SUPPORT OPERATIONAL IMPROVEMENTS IN OUR LAUNCH CAPABILITIES, WE ARE ALSO COMMITTED TO INSTITUTING THE MOST PRACTICAL, COST-EFFECTIVE AND SUCCESS-ORIENTED LAUNCH VEHICLE PROCUREMENT STRATEGIES. WE BELIEVE THAT A RANGE OF SPACE LAUNCH SUPPORT OPTIONS IS REQUIRED TO ADDRESS THE WIDE SPECTRUM OF GOVERNMENT MISSIONS; THAT THE DEGREE OF GOVERNMENT INVOLVEMENT SHOULD BE DETERMINED ON A BASIS OF BOTH MISSION CRITICALITY AND COST; AND THAT THE APPLICATION OF COMMERCIALLY REASONABLE PROCUREMENT PRACTICES TO ANY PROCUREMENT STRATEGY RANGES FROM TOTAL COMMERCIAL PRACTICES WITH NO GOVERNMENT INVOLVEMENT AT ONE EXTREME, TO GOVERNMENT CONTROL AT THE OTHER. LET ME ASSURE YOU, THE DoD IS AT THE FOREFRONT IN DEFINING AND IMPLEMENTING NEW METHODS FOR ACQUIRING COMMERCIAL

PRODUCTS, AND FULLY UNDERSTANDS THE NEED TO CONTINUE THIS APPROACH TO THE DEGREE THAT MISSION NEEDS PERMIT. IT WAS THIS PHILOSOPHY, AND THE SUCCESSFUL USE OF A VARIETY OF COMMERCIAL PROCUREMENT PRACTICES IN OUR MEDIUM LAUNCH VEHICLE (MLV) I AND II ACQUISITIONS, THAT ALLOWED US TO MAKE FURTHER ADVANCES IN APPLYING COMMERCIAL PRINCIPLES TO OUR ONGOING AIR FORCE SMALL LAUNCH VEHICLE AND MLV III PROCUREMENTS. THE SMALL LAUNCH VEHICLE CONTRACT, WHICH IS A SERVICE CONTRACT, PROVIDES FOR ONE LAUNCH IN 1991 AND TWO THEREAFTER. WE ARE PRESENTLY IN SOURCE SELECTION ON THIS CONTRACT, AND EXPECT AWARD SOON. THE MLV III REQUEST FOR PROPOSAL IS SCHEDULED FOR RELEASE THIS SUMMER, WITH CONTRACT AWARD LATE NEXT YEAR. WE PLAN TO BUY FOUR LAUNCHES PER YEAR UNDER THIS CONTRACT WITH A SCHEDULED FIRST LAUNCH IN THE LATE '95 TIMEFRAME.

I WOULD LIKE TO CLOSE BY SAYING THAT WE WANT TO SEE SUCCESS AND GROWTH IN THE COMMERCIAL SPACE LAUNCH INDUSTRY. THE EXPANDED INDUSTRIAL BASE WILL ONLY SERVE TO ENHANCE DoD OPTIONS AND REALIZE POTENTIAL COST SAVINGS. A ROBUST COMMERCIAL LAUNCH INDUSTRY BUILT ON THIS INDUSTRIAL BASE CAN TRULY LEAD TO A GREATER PARTNERSHIP, WHERE ALL SPACE SECTORS BENEFIT. DoD WILL CONTINUE TO MAKE INVESTMENTS IN LAUNCH SYSTEMS AND INFRASTRUCTURE TO SATISFY OUR MISSION NEEDS. WITHOUT THIS INVESTMENT IN OUR NATION'S LAUNCH FUTURE, COMMERCIAL GAINS WILL BE ON THE MARGIN, AND WE WILL CONTINUE TO SUFFER SYSTEM INEFFICIENCIES, NEVER REALIZING THE ADVANTAGES NEWER TECHNOLOGY WILL BRING IN LOWER COSTS AND INCREASED THROUGHPUT. NEW TECHNOLOGIES, MODERNIZED INFRASTRUCTURE, AND A NEW GENERATION OF SPACE LAUNCH VEHICLES PROVIDE THE PATH TO THE FUTURE. OUR ADVANCED LAUNCH DEVELOPMENT PROGRAM (ALDP) IS THE FIRST STEP ALONG THAT PATH. ALDP TECHNOLOGY SUPPORTS THE FUTURE DEVELOPMENT OF A LAUNCH CAPABILITY WHICH WILL BE

MORE RESPONSIVE, RELIABLE, AND SIGNIFICANTLY LESS COSTLY THAN CURRENT BOOSTERS. WE NEED SUCH A SYSTEM TO ENABLE U.S. COMMERCIAL PROVIDERS TO COMPETE EFFECTIVELY IN THE INTERNATIONAL MARKETPLACE, AND ALSO MEET CIVIL AND NATIONAL SECURITY REQUIREMENTS. ACQUIRING SUCH A NEW LAUNCH CAPABILITY WILL REQUIRE A NATIONAL COMMITMENT FOCUSED ON A FAMILY OF VEHICLES THAT MEET THE MISSION REQUIREMENTS OF ALL USERS. THE DoD STANDS READY TO ADDRESS THIS NATIONAL COMMITMENT WITH NASA, THE OTHER CONCERNED AGENCIES, INDUSTRY AND THE CONGRESS.

MR CHAIRMAN, I THANK YOU FOR THE TIME TO PRESENT THESE OPENING REMARKS, AND I LOOK FORWARD TO YOUR QUESTIONS.



Biography

United States Air Force

Secretary of the Air Force, Office of Public Affairs, Washington, D.C. 20330-1000

RICHARD M. McCORMICK

Richard M. McCormick is the Deputy Assistant Secretary of the Air Force for Space Plans and Policy. As the principal adviser to the Assistant Secretary of the Air Force (Space), he formulates policies and develops plans that affect Air Force space programs and missions. He has responsibility for interacting with agencies external to the U.S. Air Force on space policy issues and represents the Air Force in Department of Defense and national policy forums. In this capacity he is responsible for negotiating and coordinating interagency agreements related to Air Force space responsibilities. Mr. McCormick is the focal point for Air Force support to commercial space activities and is responsible for program and policy coordination with NASA. He also advises the secretary and under secretary on the space policy implications of arms control proposals or agreements, space program and budget issues, and on interagency and interdepartmental space matters.



Mr. McCormick was born April 17, 1941, in Grand Rapids, Mich. He received a bachelor of science degree in electrical engineering from the Virginia Military Institute in 1964 and a master's degree in engineering administration from George Washington University in 1981. Mr. McCormick served 20 years in the Air Force, retiring in 1985.

Following assignments providing communications to NATO, Mr. McCormick served from 1977 to 1979 as deputy for advanced technology to the deputy under secretary of the Air Force for space systems, where he managed a multi-faceted research and technology program supporting national security space programs. In 1979 he was selected as the assistant for space policy to the deputy under secretary of defense for policy. In this capacity he was the single focal point in the Office of the Secretary of Defense for space policy and requirements for national security and civil space sectors, the military departments, other executive branch agencies and the executive office of the president.

In 1982 Mr. McCormick became special assistant to the assistant secretary of defense for research and technology, where he was responsible for all matters of policy implementation, management and acquisition for national security space activities. From 1983 to 1985 he served as senior policy analyst on the intelligence community staff. He served as a senior adviser to the director of central intelligence, and was responsible for interdepartmental policies including national intelligence support to the military operational forces. Upon retirement from active duty in 1985, he joined ESL, a Sunnyvale, Calif., based subsidiary of TRW, as one of the founders of ESL's Washington Systems Engineering Office. He served as a program manager for developing advanced space systems capabilities. He was appointed to his present position in June 1988.

His military decorations and awards include the Defense Meritorious Service Medal, Meritorious Service Medal, Joint Service Commendation Medal and Air Force Commendation Medal.

Mr. McCormick is married to the former Sharon Lockwood of Fairfax, Va.

(Current as of November 1988)

Mr. NELSON. Thank you, Mr. McCormick, and to give credit where credit is due, it is due to your and my mutual good friend—and former Secretary of the Air Force, Pete Aldridge, should be given the credit—that when he put out the request for proposal for a medium launch vehicle, he did so by inserting in the RFP how and what way could it most efficiently, in addition to being a Government launch vehicle, be used in the commercial rocket business. I appreciate that kind of foresightedness on the former Secretary's part.

Mr. Walker for questions.

Mr. WALKER. Thank you, Mr. Chairman. A couple of different areas here.

Mr. McCormick, if title II of the 1991 NASA authorization bill, which directs the purchase of commercial space transportation services, were to be applied to DOD, how would that effect your operation?

Mr. McCORMICK. As I recall the title II, it fundamentally lays out pretty much the manner in which we're going about our business now, when you—especially when you look across the different procurements that we have had with the Atlas II, Delta II, now going into the small launch vehicle and then the follow on to the Delta class MLV.

As we have gone down that road, we have, in fact, learned from each one of those procurements and have consistently tried to seek ways of being able to get out of the way that we have done the business in the past and put more commercial practices in, negotiate with the offerors, and reach a point where we are satisfied that the risk element has not increased, because our fundamental purpose is to put space mission on orbit and our obligation to the taxpayer is to do that in the cheapest, most reliable fashion that we can.

I think that, by and large, as long as we maintain the options to be able to tailor in each case the correct amount of commercial practices, and to negotiate specifications, that the title II fundamentally says the way we do business.

Mr. WALKER. So at the very least there is not a wide gap between what we adopted there and what you see as the developing DOD practices.

Mr. Frankle, can we assume that your testimony would pretty much represent what you regard as the status of the implementation of the mixed fleet plan?

Mr. FRANKLE. Yes, Mr. Walker.

Mr. WALKER. When you went through the medium and small ELV programs, that represents where NASA thinks it stands in terms of implementation of the mixed fleet plan.

Mr. FRANKLE. At this time.

Mr. WALKER. I thank you.

Do you support the request by industry to use excess DOD assets, such as Poseidon missiles, for small ELV procurement?

Mr. FRANKLE. Are we talking generically or specifically, Mr. Walker?

Mr. WALKER. We're talking—well, talking generically primarily, although by mentioning Poseidon, I guess we're getting somewhat specific.

Mr. FRANKLE. Mr. Walker, we feel that whatever assets are available should be used. We do have, as you know, an ongoing procurement, which is in the middle of it and I really don't want to comment on some procurement issues.

Mr. WALKER. Okay. Yeah, I understand.

Mr. FRANKLE. Certainly assets that are out there and available, that can be used, should be used. Now, whether they can be used on a given contract or not is another issue that I think is best left for another day.

Mr. WALKER. With regard to the ALDP program, Mr. McCormick, I agree with your statement. I mean, the advanced technology is obviously an important feature of assuring that we are competitive with our world competitors in the future.

The way it reads would seem to indicate, however, that for an advanced program, the Air Force sees itself purchasing specific vehicles and maybe even a fleet of vehicles in order to improve the technology. Is that your understanding of the program, or are we doing this in much the same way as we now do aeronautical technology, where we buy essentially an experimental airplane and then industry uses the advances off that to improve their vehicles or to design new fleets of vehicles in the future?

Mr. McCORMICK. I guess I would say probably a combination of both. I think that the fleet of launch vehicles that we have now were built over a number of years on a basis of ICBMs. Now, they are significantly different now than they were 20 years ago. But nevertheless, to gain what I believe both we in the Department of Defense and industry on the commercial side are seeking; to get significant reductions in cost of launch vehicles, to be able to increase our throughput and be able to get more launches off, to be able to, in fact, increase reliability, we have to go to almost a clean sheet of paper. With that in mind, we're talking about new prototypes, new designs, testing, and building a capability, so that the Department of Defense can then procure those launch vehicles, we can develop a new launch structure, make major improvements to the infrastructure that supports that. That, then, puts industry in the ability to build off of that to apply it to the commercial side. So I really see it as kind of a combination of both.

But the cost is so high that it would, to me, be impossible for industry to go it alone, just to try to gain those advantages to meet the commercial side. I think it's a matter of a partnership between the Government and industry.

Mr. WALKER. Let me go to a specific—and I raise it with both of you to begin with, and then I want to go to a couple of points in your testimony.

Can we assume for the basis of discussion here for a minute, that both NASA and the Department of Defense could use a heavy lift launch vehicle?

Mr. FRANKLE. Mr. Walker, I think there are many people who feel that a heavy lift launch vehicle is vital to do things that we want to do in the future. It isn't necessarily true that for already funded, on-the-book programs you necessarily need it.

Mr. WALKER. I'm just saying—again, I'm making it kind of a generic point. You know, can we assume, just for the basis of discus-

sion here for a moment, that if a heavy lift launch vehicle were available, that NASA would have use for it?

Mr. FRANKLE. I presume we would find a possible use for it.

Mr. WALKER. And could we assume the Department of Defense would have use for a heavy lift launch vehicle if it were a part of the inventory?

Mr. McCORMICK. Well, if you're talking generically, I guess I would have to say that, right now, we have no requirement. The basic requirement that we had in Defense for heavy lift, per se, meaning 120,000, 200,000 pound class, was the Strategic Defense Initiative—

Mr. WALKER. Right.

Mr. McCORMICK. —and the architecture they had.

Now that it's gone to a brilliant pebbles based architecture, Defense really doesn't have a need for that high a level, which is different than saying an improved Titan IV class, 60,000, 80,000 pounds. So in that context, we don't have a requirement to put—Defense doesn't have a requirement to put money directly into heavy lift, at this point.

Mr. WALKER. No, that's not my question, though. My question is more, if it were available in the inventory, would it be something that Air Force would ultimately be able to use? I'm not asking you now the budget question. You know. I'm asking you, if it were out there and available, would it be likely that Defense would use that capability?

Mr. McCORMICK. Oh, we would certainly look at it.

Mr. NELSON. With gusto.

Mr. WALKER. Yeah.

Well, if, in fact, that's the case, then I guess my follow-up question is, what steps have been taken to see if the commercial market could offer such a vehicle by either NASA or by Defense?

Mr. McCORMICK. I don't believe, to my knowledge, that we have ever specifically gone out to the private sector in a commercial context for that. What we've done is, you know, go into the advanced launch vehicle program, which was a family of vehicles that cover the spectrum from the Titan class up to the heavy class. That was our orientation. In that context, we were dealing with the aerospace industry, but we never specifically went out on a commercial basis asking what they could do for heavy lift.

Mr. WALKER. Okay.

Mr. Frankle?

Mr. FRANKLE. I think the answer is quite similar. I know there have been people come in on an informal discussion basis to talk about things, but before you can go out and really solicit people to start putting money and time and effort into coming up with serious proposals and concepts, and start moving out to accomplish a goal, I think there needs to be some realistic chance that the Government is going to be able to take its share and pay for its part, and we don't—Since we have no such program and no programs, as I said before, that we have now that absolutely require that, we haven't done it.

If we had a program that was approved, that needed it, we would have to look at all sorts of ways to accomplish it. That would be one. We would have to take a look. I know that we are working in

the—we started off, for instance, doing some technology work towards the ALS, as Mr. McCormick said, and that was reduced from program to technology and we're working a propulsion technology program right now and that's all.

I would think that if we get to the point where that propulsion technology program actually comes up with an engine that can be producible and works, that could be spun off either by Government or by commercial both into a bigger vehicle. But we're several years from that.

Mr. WALKER. Well, let me suggest to you that on page 3 of your testimony, I circled a paragraph there that begins with the words "For example", and then goes in and talks about how NASA acquires ELV services. I mean, that particular paragraph is very encouraging to people like me, who have for years suggested that we ought not be requiring all kinds of military specs and Federal specs and so on before we go out and acquire these vehicles. We ought to just go out and buy them like we would buy a ride aboard a truck or a bus across the country. I see that as an encouraging development in a particular direction.

But you understand that what you just told me in your testimony here indicates that that's fine, as long as you know about the vehicle out there, but it's not fine if you're talking about some new generation of vehicle that we don't have. And my question for you is—it's almost an attitude check—why not? Why not have at least some encouragement to the domestic industry, to say to them, hey, we have a need for a vehicle—you know, why don't you come in and tell us what you might be able to offer.

Now, I will tell you that they probably will come in with some low-tech solution to what you want, and it will not be something that will utilize every new advance that we expect for the next 20 years, but it might do the job. If you would use that paragraph as an example of what you might ask for, you might get some very interesting data back in from commercial vendors who would say yep, if you have need for a vehicle, and if you can show me there is marketability for that vehicle, that you actually are going to, for instance, put space station components aboard a heavy lift vehicle and send them out there, rather than using 15 shuttle missions to do it, that I might be able to provide you with that particular kind of capacity. It won't be something with all the bells and whistles on it.

I guess my question for you, and ancillary to the Department of Defense, is why aren't we doing some of that? If we really want a vibrant commercial market, why aren't we saying to people, look, there are technologies out there that we know are usable technologies; some of them are advances; some of them are just doing over and over again that which we've already learned how to do. Why not say to the commercial market, tell us what you can do for us, rather than always starting with the assumption that you have to develop a new engine, or you have to develop a new flight regime, or you have to develop all kinds of new stuff in order to do something that needs to be done. That is not an assumption that we necessarily have to work from if we're going to have the commercial markets work.

Mr. FRANKLE. Mr. Walker, the engine program and the technology development program, those kind of things, are being done for a lot of different reasons. We have a subcommittee of our NASA Advisory Committee that works with the launch industry. There is a report of AIA that Mr. Nelson talked about, there's the COM-STAC, which is the Commercial Space Transportation Advisory Committee, which is also comprised of high members of the commercial launch industry. Unanimously, all of those groups feel that the Government should be heavily involved in technology development. That's what we're trying to do in those areas. And we are developing it because in many cases we're trying to support the industry.

We do not go out and say this is what we need, because need, in that sense, is a firm term of art, which has been defined by years of working as an agency with not only within the Executive branch and OMB but also with Congress. Congress sometimes gets exercised with agencies that go out and say they need something before there's an authorized program to proceed, for fear that is putting pressure on the authorization or appropriation process unnecessarily before it's been approved as a program. We have no need for that vehicle at this time.

Mr. WALKER. Well, we can argue over semantics, but the fact is that, to many of us who look at the shuttle manifests over the next few years, and if you, in fact, intend to do the space station under any kind of schedule that is going to be completed on time, you probably do have a need for the vehicle, whether or not that is defined as your need at the present time or not.

But the point I'm making is, whether you do it that way or whether you do it as simply to begin to mobilize some effort out there, every time you talk about the fact that you have to have all kinds of advanced technology in order to go ahead to the next generation of vehicle, or to do something new, is when it seems to me you drive a lot of commercial vendors out of the marketplace.

I believe that that committee meets and says that, because, you know, the people who have traditionally been a part of the aerospace industry are obviously going to look for all of the help that they can get in order to do the research they need to do something for the future. The fact is, though, there may be some other people out there that are not sitting in that room who have some ideas as well, and who would very much welcome the chance to show you what they could do with presently available technology, or with upgrades of presently available technology. That's the kind of thing which is not being done right now to promote commercialization.

All I'm suggesting to you is, if you would take the attitude that you're developing now with regard to procuring ELVs that are presently in the marketplace and begin to think in those kinds of terms for things that don't yet exist, but would provide real useful add-ons to the present space program, you might find that there are some amazing things that could be done by industry and that there are an amazing number of investors out there who would be glad to put money into programs that they thought were going to fulfill a specific part of space needs for the future. That's the attitudinal change that I think has to accompany this, that it cannot

be simply incremental where we take that which is and buy it according to these standards.

In part, I guess that's a lecture. But it is also, I think, fundamental to assuring that we get a good, viable commercial industry in the future.

Thank you, Mr. Chairman.

Mr. NELSON. Thank you, Mr. Walker.

Please understand that the committee starts with a significant bias, that we firmly believe that there is going to be the need for a heavy lift capability, and at every opportunity. When we have the Executive branch of Government before us, we take that opportunity to remind the Executive branch that the space shuttle needs to be complemented with a heavy lift capability to do all of the things that we want to do, particularly the space station and beyond. This is an interesting way in which that aspect of heavy lift, in coming out from Mr. Walker's suggestion, in looking at ways to finance it, because the way it has been zapped over this past year—and I recall for you, when we passed the subcommittee bill, we provided in there the authorization for funding for a heavy lift capability. By the time that it passed the full committee, which was late in 1990, it became very apparent that, under the summit agreement, there simply wasn't going to be enough money to go around to do space station, to keep the space shuttle system operating as it is, to move on with the development of the advanced solid rocket motor, to move to the development of the lifeboat which will be attached to the space station and so forth and so on. There wasn't enough money to do all of that.

So that's why then in full committee I went along with reducing the appropriation to \$10 million to keep alive the studies on moving toward a heavy lift capability. But that's short-sighted. So again, we're going to take this opportunity to remind the Executive branch of Government—

Mr. WALKER. Well, if you would yield, Mr. Chairman—

Mr. NELSON. Sure.

Mr. WALKER. The problem is there's never going to be enough money.

Mr. NELSON. Sure.

Mr. WALKER. You know, what we're facing in terms of the budget squeeze in the future, regardless of the fact that NASA is going to continue to increase in funding, there is never going to be enough money to do some of these programs. What we've got to do is figure out a way to leverage money that has not traditionally been a part of space developmental activities.

The one place you leverage money is in the investor community. When you get entrepreneurs who are willing to come in with large sums of money because there's a payoff in the end, it seems to me that we have a national need in heavy lift capacity that might well be addressed by the investor community if there was, in fact, some indication from Government that they were really willing to utilize that capability, should it be provided.

You know, I think this is a great opportunity for us to see the commercial market respond. But they are going to have to have an awful lot of encouragement that they haven't had up until now, that what they develop would be utilized.

Thank you.

Mr. NELSON. Now, on that same theme of commercial activity, of investors and of private money, let me ask a couple of questions of both of you. I would like to start.

Just a few days ago, the New York Times did an article about specifically the activities going on here, entitled "Cape Canaveral Needs to Renovate". I will quote a couple of parts from this article.

"The Committee—" in this case, it was referring to the AIA report that I quoted from a while ago—"recommended that the launching infrastructure at Cape Canaveral be modernized quickly, a step, it said, would do the most to aid the domestic launch industry."

Continuing. "Companies are all trying to reduce their time, the time the rockets spend on the launching pads. McDonnell Douglas is trying to reduce the on-pad time of the Delta rockets from about 40 workdays to half of that. The company is building a separate hangar away from the launching pad where it can conduct pressure tests on rocket stages. A time-consuming operation, it is currently done as the rocket sits on the pad. During the test, which can last a few days, all other work on the pad must be halted for safety reasons."

Now, both of you have stated very interesting things in indicating that you recognize that. Mr. McCormick, you actually made reference to specific things. For example, in your testimony on page 4, the Test Operations Control Center will, for the first time, provide ESMC the capability to perform simultaneous range operations on two different vehicles. What now can take up to three days, will take only one hour. You're talking about a facility to perform a second stage, high pressure and solid rocket motor leak test and so forth.

Then my question to you, Mr. McCormick, is give us your view on the infrastructure improvements that you think could be done and those infrastructure improvements suggested in this article. And then give us some idea that, if we could get some kind of consortium going here, what would DOD be willing to finance.

Mr. McCORMICK. Well, let me give you a general answer and then, if I can, I would like to turn to Colonel Wormington, who is the ESMC Commander, who can give you some more specifics.

Let me just give a quick lead in. If we go back to the last ten years, when we were fundamentally going totally to the shuttle. we didn't do the kinds of investments that the Air Force normally would do to keep its facilities up and modernized. And so we find ourselves in a position where we have to make—we have to fix a lot of things and we have to modernize, so that we, in fact, can start meeting the significant increase in the activity here at ESMC.

Now, with that in mind, we within the Air Force, and the Air Force within the Department of Defense, are trying to get as much money as we can to apply to this, but we clearly have to compete with lots of other equally important activities. That's one of the reasons why we, within the law and the directives within the Department of Defense, we are trying to be as innovative, and Colonel Wormington, in particular, is trying to be as innovative as he can in seeing how we can try to fix some of these facilities, whether it be nothing more complex than having to put in a new transmitter

because the old one uses tubes that are no longer viable anywhere, or whether it's a matter of building an off-line Centaur processing capability so we can get as much activity as we can off of the pad because we spend too much time on the Titan pads.

So you go to the new Operations Control Center. It gives a capability, among many other things, to be able to be testing while we're actually conducting launch operations, which really doesn't exist to that degree right now. So, with that in mind, we are seeking ways.

The Air Force's fundamental responsibility is to put the Defense mission on orbit and, within the capacity of the range, to provide as much support as we can to the commercial. That's why, when a commercial operation gets manifested, it gets equal attention with the national security launches.

So let me, if I can, turn to Colonel Wormington, and he can give you some more specifics about that.

Mr. NELSON. Colonel, we're delighted to have you. Indeed, I was negligent in not recognizing you early. But you were sitting back in the shadows there and I did not see your face. We're delighted to have you as the ESMC Commander here. Please.

Colonel WORMINGTON. Sir, it's a pleasure to be here.

Let me answer the question in three parts. There is a tip of the iceberg that people concentrate on when it comes to launch activities, and that is the flight hardware itself. Now, that tip of the iceberg represents about 50 launches a year. Those programs that we have implemented to benefit, to improve those operations, generally speaking, are funded by the program's concerns. So the Delta program, the launch vehicle programs, would fund the facility improvements, the processing improvements, and push for those things in order to maximize their own capability. I operate those things, but the funding for those comes from the programs concerned, including the commercial programs. There is a great deal of activity in that area to try to improve the capability for an individual program, a Delta, a Titan, an Atlas.

One step down from that is the thing called the Eastern Test Range. That is a support function that provides communications, optics, telemetry, radar support, for all flights, including the NASA flights from Cape—from Kennedy Space Center.

There I find that. I am the responsible agent for generating requirements for that. The Test Operations Control Center is a good example of how we're trying to upgrade that. But, in general, the range is an old facility. It was put together incrementally over 30 years. It has all the problems associated with an incrementally-improved collection of old and new. We have a significant improvement and modernization requirement. We are attacking it as we get the money.

The third step of that is the nonglamorous but equally important base operations capability, if you will: do you have electrical power; do you have facilities; do you have sewage plants; do you have roads that support an increased activity. The answer there is the Cape Canaveral Air Force Station was put together between 1956 and 1962 by the ICBM program. So most of my facilities, most of my infrastructure, dates from that time frame, and it's old. We have a significant requirement to go in and attack the nonglamor-

ous but very important support structure that goes along with launch operations.

So we have a significant electrical power distribution problem, a communications problem, needing to upgrade the fiber optics, roads and grounds, sewage plants, all the things that are necessary to make—to build a foundation upon which we can do all the rest of this.

We tend to concentrate on the 30 to 50 launches per year. People don't recognize that there are 14,000 range operations, so what you don't see—you see 30 to 50 launches; you don't see that that's the tip of the iceberg and there's a tremendous number of range operations leading up to each launch. We have to work to deconflict many of those things because of the competition for those resources. We do that quite well. The TOCC will help us.

What we haven't concentrated on and what we need to concentrate on is the base operations level, the very mundane but very necessary electrical power, water, sewage, roads and grounds, those sorts of things.

Mr. NELSON. I would like to ask you, Colonel, this report that I quoted from earlier, which was the report to the Secretary of the Department of Transportation—

Colonel WORMINGTON. Yes, sir.

Mr. NELSON. —put together by the Aerospace Industries Association, where they were interested in a flavor, an atmosphere, an attitude to being changed, from this being looked at as an Air Force range to a national range operated by the Air Force.

You understand the distinction there?

Colonel WORMINGTON. Yes, sir, I do.

Mr. NELSON. Would you like to comment on that?

Colonel WORMINGTON. We view ourselves as a national range. If you look to see who is flying on that range, the minority of them are the United States Government and the majority are the commercials right now. We are doing a great deal of work to support the national space program. I understand my responsibilities to be to support the entire space program, and I think when you talk with the people that are supported here, the McDonnell Douglasses, the General Dynamics, the Martins, you'll find that we have a very good, collegial approach towards this thing, where we all have a job to do, we all get together and do the job.

I don't think you'll find a great deal of complaint about the way the Air Force is running this national space program, in terms of communicating conflicts of interest, working for the common good.

Mr. NELSON. Two years ago we capped a three-year effort by passing a law that would try to assist the commercial launchers by sharing the risk of launch, both from a standpoint of liability as well as property damage, which we did with the Commercial Space Launch Act, and in addition, addressing the question of the schedule upon which commercial launchers could rely since they were launching on a Government range. What we tried to prevent in the law was the situation where arbitrarily the Government could bump a commercial launcher for no reason other than an arbitrary reason and built that into law, where there was a check process, and it would go all the way to the level of the Secretary of Defense, Secretary of Transportation, NASA Administrator and so forth.

As you have seen this law now be implemented over the last couple of years, could you give us your comments, from your perspective, as the Government and the fellow who runs the range, does it get in your way; does it not; does it enable, from your standpoint, the commercial operators to get off on time? Give us your comments.

Colonel WORMINGTON. Sir, we operate the range with two rules. One is that if you're on schedule and stay on schedule, we'll protect you. The second rule is common sense rules.

In the time that I have been here, we have had a number of possible conflicts, in terms of the eventual launch date. All of those have been solved at the local level by this collegiate operation that I talked about. Because each of us understands that my problem today may be exactly identical to your problem tomorrow, and so if I request help today, you may be requesting help tomorrow.

You will find that this is a very cooperative group down here. In the times that we've had to work schedule conflicts, invariably it works out that if you are staying on schedule—in short, if your flow is going as you requested, and you are going to launch on the date that you want to launch, generally speaking, you are protected. You will continue to flow and people will move around you to accommodate your flow.

The common sense rule comes when there is something very significant happening that says, for safety reasons, or for just general good sense, we want to interrupt that process. So, for example, when we're trying to process a shuttle early in this year, and the shuttle needed some—it attempted to launch, did not launch, needed to delay, it delayed into the projected launch date for a Delta. McDonnell Douglas gave way voluntarily, and in a very helpful way, to allow the shuttle to continue processing because of the momentum—I'll put it that way—and that the number of people involved in continuing to process that shuttle and get it off.

A classic example of the helpfulness of the local organization to the benefit of all parties. McDonnell Douglas got its launch off about three days late. We did not ask that they delay. They volunteered.

We have come across similar examples where, at the working level, it has worked out. If I take the radar or the command systems this time, and you give it up next time so I can get my job done, that works. It works well. We have never had an instance where I even thought about going up through the chain of command to the Secretary of Defense to ask for any—

Mr. NELSON. Well, I commend you for that, and that's the way the system is supposed to work. Of course, McDonnell Douglas in this specific example was most appropriate in their voluntary suggestion by virtue of the fact that the mission of the space shuttle is obviously of national significance, and in the pecking order they would have to stand down. So that's great.

You look at the customers who are going to ride those commercial rockets, and they're looking at cost and they're looking at reliability. We have been addressing the reliability question here. And if you all will continue to make that reliability so that they, the customer, as they look at an array of rockets, a French, now a Chinese, ultimately a Soviet, a Japanese rocket, and say we want it on

an American because we know we're going to have, given certain confines, we're going to have the reliability of getting off on time.

Now let's come over to the cost side. We're going to examine this the rest of this hearing, the cost of how we get launches, a new generation of launches, down. We'll say that for a moment. Let's talk about the cost of the procedures. Mr. McCormick listed out a whole bunch of them. The Florida—Spaceport Florida has come out with an idea here—you all have seen that—of getting the Air Force, NASA, the State of Florida, and the commercial rocket manufacturers all to come together to update what is 30 year old equipment that you're talking about on the range.

What do you think about that? I would like to hear all three of you talk about that.

Colonel WORMINGTON. Speaking as the guy who has to operate it, I'm in favor of getting the new equipment. So if there is a way to do that, that will help us get the mission done, we're in favor of that way, as long as it meets the requirements for all of the users. So I have a number of requirements to satisfy: the commercial launch vehicle companies and their need for dependable access and reliable flights; the civilian/government side of it for their requirements; and the military side, which adds a requirement for security. So long as I can keep my facilities in such a manner that I can protect all people's requirements—and, by the way, there are classic examples of industrial security requirements that may be as stringent as some of the military requirements for security—as long as I can accommodate all of those requirements, I have no problem with that approach.

Mr. NELSON. Mr. McCormick.

Mr. MCCORMICK. Well, I would agree with what Colonel Wormington said, and I guess I would add that we, the Air Force, owns and operates the facilities that we fund. And the fundamental reason for that, aside from just history, is that we do have—We look at space predominantly in an operational context. We use satellites to perform very specific functions in helping the Department of Defense prosecute its missions. And so, with that in mind, we believe that we operate it as a national range, however you want to define that, and we would look for any means that are reasonable and within the law and are executable in order for us to get the funds, in order to build the infrastructure, in order to have the best capability down here.

We would, I think, in general consider that the Air Force should continue operating and being responsible for it, so there is a matter of, as long as we are satisfied under almost any set of circumstances, that we can meet our mission needs, and in that very rare instance where there is a need for national security to take the priority, that the capability exists for that, then I think we would be amenable to any reasonable idea.

Mr. NELSON. Well, let's take a specific example. In the 30-year equipment out here, and checkout procedures and so forth, you have the old blockhouse concept. Now it's being proposed—let's look at a multiuser, central facility, as a vehicle checkout station, firing room, customer data display area, and R&D laboratory, if you will.

What do you think about that from DOD's perspective?

Mr. McCORMICK. Well, without getting into more detail, on the face of it, I don't see anything particularly onerous about it from the Air Force's standpoint. I think it's the kind of thing that we would discuss and see, in essence, how it would work, how it would benefit the Air Force, satisfy the context of what's in it for the Air Force, and then, if we were to all agree that that's a good thing to do, that it's very useful, if we can do it within the law, then we would. If we couldn't and we were championing it, then we would request a change in the law, if that was necessary.

Mr. NELSON. Well, I would encourage you to look at this, because the bottom line is, what we're trying to do is bring down the cost.

Mr. McCORMICK. Yes, sir.

Mr. NELSON. Now, there is two ways to bring down cost. One, you develop a new kind of vehicle that brings down the cost, like the French are with the Ariane V. Number two, the way you bring down cost is you update all of this old equipment so that you can make it less labor-intensive and that you have, although more expensive equipment, nevertheless saving you an enormous amount of time and getting efficiencies in the checkout procedures.

Now, that's going to help you, as the operator of a range, or as the operator of the Department of Defense putting up missions, because your missions will go off some of those pads that we're looking at that likewise will be used as otherwise commercial pads. A good example is Delta. Delta has put up SDI missions; Delta is putting up commercial communications satellites.

What do you think about it, Mr. Frankle?

Mr. FRANKLE. I think I share the views of Mr. McCormick. I think that there's nothing inconsistent, certainly anything we're doing. Our facilities are not anywhere near as involved as the Air Force's facilities here. The facilities that we use to support the industry basically are limited to some specialized payload processing facilities, which are fairly new and up-to-date, so we don't have exactly the same problems, and even then we don't always use them because there are some commercial facilities and we do our best not to compete with commercial providers.

But we have in the past, and I presume we will in the future, work with the Air Force to update facilities, when needed, for our missions. In that type of game, the more the merrier. If you can fit everybody's requirements in and keep the necessary security, keep the flows separate and still maintain—and still improve the facility—I don't know why anyone would oppose that.

Mr. NELSON. Mr. Walker.

Mr. WALKER. If you would yield for just a moment, I want to go back to the point about it being a national range and so on, and I appreciate your statement on that.

You know, the thing that I want to get clear in my mind is how far we are committed to some of these things in terms of commercialization. Commercialization goes well beyond the issue of whether or not you're firing off something that's called a commercial rocket versus a military rocket, and I'll give you one example. I don't know if this is a good idea or a bad idea. I just give it as an example.

Space commercialization involves things like space tourism. I mean, this facility is an example of that. It seems to me that if you

have a national range, and you and I were talking in a discussion last night about the number of visitors that want to come down for some of these launches, if you're firing off 30 or 40 launches a year, there are people all over this country that want to watch those launches.

Now, I mean, one of the questions is whether or not you, for instance, would be willing to allow land to be leased on the Air Force station for a commercial vendor to come in and build maybe a hotel and a restaurant for people to come to, to watch those launches. And who knows, if you could get the investors to do that, they might even be willing to put in some of the infrastructure that you need in order to maintain that, and it would be done at their expense rather than at Government expense. In fact, they would be paying lease payments for it. I mean, there are a lot of things like that that we ought to look at if we really are regarding these things as national ranges and so on.

I mean, are those kinds of things being asked as a part of all of this?

Mr. NELSON. You will throw the Department of Defense into apoplexy.

[Laughter.]

Mr. WALKER. But if it's a national range and not a Defense base, then, in fact, some of these things are open that were never open before to discussion.

You know, this is the alternative to space tourism to—we loveonyms in this business—to the LOHI. Now, no one has ever heard of LOHI before, but that's the Low Orbit Holiday Inn.

[Laughter.]

We're not likely to get that in the near future, but we can, in fact, though, involve a lot of people into the business of space without having them leave Earth. The fact is that we are the only country in the world presently that can offer those kinds of things to people, because Kourou is not a place that's going to attract many tourists in the near future, and from what I hear, Cape York isn't, either. So we are, in fact, the people with facilities to be able to use some of this and attract people worldwide who want to get involved with space activities.

Colonel WORMINGTON. Let me answer the question a couple of ways, sir, and first try to dissuade you that we would turn apoplectic, and second, to tell you that I have been a tourist to Kourou and I don't think I want to go back.

Mr. WALKER. I have been, too. I might want to go back some time, but it won't be with joy.

Colonel WORMINGTON. And tell you that right over here at one of these ticket stands you could buy a ticket for a bus ride to go around Cape Canaveral Air Force Base, so it's not an issue as to whether or not we will prohibit that kind of view of what is over there.

Let me also comment that—and without wanting to attack your entire approach by concentrating on a specific—let me say that—

Mr. WALKER. I'm not even sure it's a good idea. I'm just saying that that's the kind of thing that we ought to be looking at.

Colonel WORMINGTON. One of the problems—one of the tasks that I have is I'm also responsible for safety. As much as there is a

good interest in what's going on over at our place, building public availability facilities on Cape Canaveral Air Force Station is not a good idea from a public safety point of view. In fact, we spend a great deal of effort trying to ensure that the risks and hazards associated with the activities that we do—which you must understand are dangerous activities in some cases—stay within the confines of the Government land. So we put at risk people who are inside the Government land at a higher level than we would put at risk people who are outside the Government land. Moving the public inside the Cape Canaveral boundaries or inside some areas of Kennedy Space Center would significantly restrict our ability to do our job, and so we would not be at all happy about that kind of an approach.

There are other approaches that you're talking about—for example, we have been working with Spaceport Florida in order to look at how can we create more public access to what we do, including, for example, there is a museum on Cape Canaveral Air Force Station that is open to the public but not readily accessible to the public because it is right next door to the Delta facility, literally right next door. And every time we're running hazardous operations with the Delta facility, we have to close the museum. One of the things we're looking at with Spaceport Florida is can they create a visitor center, an education center, and we would look to move the museum to co-locate with them. We're trying to do those kinds of things with Spaceport Florida because they have a common goal with us in being able to incentivize people to support the space program.

Mr. WALKER. The only point that I'm making with regard to the way Government interacts on this is—I mean, there is a tendency to view things very narrowly within the confines of contracts and so on. All I'm suggesting is there is a much larger aspect to space commercialization than most of us ever think about, and insofar as we can utilize that to do some things that we want to do—I mean, you know, I don't know what the innovative scheme is, but there is probably some kind of innovative way of involving these two or three million people who come through here into your activities in a way that an investor would love and would be willing to put money into your infrastructure needs, in order to have a chance to make money off what you do over there. You know, it may not be a hotel. I don't know what it is. But there is probably some way to do that. If we really sat and thought about it and we had entrepreneurial types give us ideas on it, you might well find some money that won't be there in the near term in Government budgets to finance activities that are vital to us all.

Thank you, Mr. Chairman.

Mr. FRANKLE. Mr. Walker, if I could respond a little bit, I agree with your concept that we probably need—and I think we've been doing our level best over the last year or so to be more creative in our approach to the problems.

In respect to the financing like that of infrastructure, I'm sure you recall a few years ago we did attempt some specific efforts in that. There was one here at Kennedy, with the Space Station Processing Facility, where we allowed someone to go build a facility that we need with their money, this facility in exchange for

making it larger than we need so they could use it for helping the commercial space industry. There was another one with a neutral buoyancy lab out at Johnson where, when we were going to be using it for trying to figure out how we were going to put the station together, they would be able to use it for other things. And there was a lot of talk about the oil industry could use it, and even some of the film industry.

We didn't do very well in that and there was, just a month or so ago, a GAO report that was issued, suggesting—fairly critical and saying we probably were not realistic in our expectations of that kind. That's not saying it's a bad idea in the future, but it is saying that you really need to work closely up front and get your act together and know where you're going to go and how far you can go, to know if it's realistic to get that kind of money.

Mr. WALKER. The only point I would make to you is, what you were attempting to do was mission specific commercialization there, rather than allowing the entrepreneur to define what he wanted, and then maybe get something for your missions out of what the entrepreneur wants to do. In other words, from an investor standpoint, you were doing it backwards?

Mr. FRANKLE. Well, we had some mission specific goals, clearly, but we were allowing them to build it bigger and larger or different to accommodate their needs specifically.

Mr. WALKER. I understand. But the guys who put money up front want to do the things they want to do, not the things you want them to do. And so, if you can benefit from what it is they want to do, then you're likely to get the money. I mean, that's the only difference.

I would encourage those, and the fact that it didn't work up front doesn't mean that there is not some mission specific thing that you can get entrepreneurial money or investor money for in the future. So, regardless of that experience, I would encourage you to press forward and look for those kinds of ways.

But in this case, what I'm suggesting is that there may be a lot of things out there. When you're attracting the numbers of people, when there's the kind of interest that I know there is—I don't think a week goes by that somebody doesn't come up to me on the street in my district saying "Can you get me tickets to go in and watch a launch?" I mean, there is massive amounts of public interest out there that has got to be a way of generating money. There have got to be people that recognize that and are willing to generate money off it. And we in the Government just have to be innovative enough to understand that and figure out a way that Government facilities can benefit from that interest, rather than always looking at things in terms of what is narrowly there and what was included in last year's budget, and what can we hope to get in this year's budget and so on. We have to think in those terms; that's the way we work. But there are other opportunities out there in commercial space that we haven't even begun to explore at the present time. That's my only point.

Mr. NELSON. I want to ask both of you, since both of you are using commercial launch services, what actions have you already taken to obtain the necessary budget allocations in your budgetary planning for the future, the budget allocations to continue this

process of upgrading the launch facilities and cooperating with each other and looking at these other possibilities of cooperation with outside entities such as a spaceport authority?

Mr. FRANKLE. We do our budgetary process in a fairly integrated manner, the facilities upgrades that are required for missions as we see, and then just the overall updating of our facilities. We who have a similar aging facilities problem have seen in NASA's case facilities improvements get funded through our construction facilities budget over the past several years. That number has more than doubled and probably more than tripled if you go back five or six years, in large part in recognition of the aging facilities problem and the fact that the facilities have been neglected for many years during most of the '70s and early '80s.

What happens is the people whose missions need the facilities and know that they're going to need them in 1993, 1994 and 1995 will have to come in as part of our facilities review board process and figure out what needs to be done, how much it's going to cost, and it competes with all the other projects for funding. We make a cut and then it goes to OMB and they look at it and examine it and either do or don't make a cut, and then it goes to Congress and they either do or don't make a cut. We've been pretty successful over the past few years. There haven't been a lot of cuts in the facilities budgets, so we've been pretty good about getting that money. And that includes, I think, facilities that are being used not just exclusively for NASA purposes but also to support outsiders on a reimbursable basis.

Mr. NELSON. I'm building on what you said in your testimony, that you have 15 of the 23 missions that NASA has scheduled between now and 1995, that are going to be as a result of a commercial launch contract. That being the case, it seems that it makes eminent economic sense to NASA to bring down the cost of those launches. And yet, in the pecking order of the big scale, when you get squeezed on the dollars, as we are pursuant to the summit agreement trying to reduce the deficit, so often these little expenditures get left at the end. They're the ones that don't get made when you are trying to solve all your other list of priorities. What I want to encourage you all and the Department of Transportation—you all, DOD and NASA—is to continue to look at that and see if it doesn't make economic sense.

Mr. McCormick, do you have any comments on that?

Mr. McCORMICK. I guess I would just say that we have—Right now we fund the kinds of activities that you're talking about in our operations and maintenance budget. We have just transferred the responsibility for ESMC, in fact, to the Air Force Space Command, and one of the things the Air Force Space Command is doing, in conjunction with our people in Headquarters Air Force who have programming and budgeting responsibility, is taking a very hard look at every aspect of this. They will be coming in with a report and will be working very hard to lay out a reasonable program beyond what we already have been pushing for to get these facilities modernized and to fix the things that are, in fact, what we would call broken.

The amount of money that the Air Force, in the end, gets appropriated for operations and maintenance, which gets spread across

all the operating commands is, of course, a key element. But I will say that, within the Air Force corporate structure, fixing the facilities here and modernizing them and the same thing in the Western Test Range does maintain a very high priority and, in fact, does compete quite well with the Tactical Air Command and SAC and MAC. So I think we're doing as much as we can and I think we're doing that with the full support of the corporate Air Force.

Mr. NELSON. As you are probably aware, in the 1991 Defense authorization bill, it picked up on something that we had originally in this committee put in in the Commercial Space Launch Act of '88, and that is reducing the cost of range services to the commercial provider. Originally, for example, we were not going to allow the Department of Defense to charge the amortization of the cost of building the Eastern Space and Missile Center, ETR; that was not going to be a cost that was going to be charged to a commercial provider. To the contrary, what they were going to be charged was the direct cost associated just with that launch, the personnel and so forth.

It was further clarified in this most recent, just a month ago, DOD authorization bill for fiscal year '91, that you all would not charge anything other than the direct cost—and even a good example is cutting the grass, would it not be—those kinds of maintenance, that you wouldn't allocate those kind of maintenance costs, the road costs, the maintenance cost, the unglamorous ones, Colonel, that you talked about to a commercial launcher using your facilities.

Tell us about your implementation of that philosophy as expressed in the law.

Mr. McCORMICK. Well, from the original law, we find the definition in the law to be specific enough that it's relatively easy to implement.

We don't charge a commercial customer anything but a cost which is directly and unambiguously identifiable to the operations to specifically support him, so within the—there is a Department of Defense directive that mandates how a range facility like ESMC must charge different customers, and we treat—within that construct, we give the commercial people in the same category as the Department of Defense, which is the best category in there, and even within that, we do not charge the commercial people for things that we do, in fact, charge the Defense people. So the examples that you gave are good examples of the things that we've done.

Mr. NELSON. All right. There's another category now. There is a category called eligible satellites. These are the ones that we made special provision for in the law by virtue of the fact that they had been kicked off the space shuttle, and we said basically we're going to allow them free launch services because they are a special category needing national attention.

What have you done to implement that part of the law?

Mr. McCORMICK. Well, as you're aware, in the appropriations conference bill, Defense bill, there was language put in there to the effect that up to \$20 million we would, in fact, pay those kinds of charges in some fashion for those eligible satellites. Now, since that has just come out, we're in the process now in the Department of

Defense of figuring out what, you know, specifically we're going to do.

So I guess I would say, in that context, that with that language in there, we now at least have the capability to go out and address that from the Defense side. So we're in the process right now of working with our people in the acquisition and financial management part of the Air staff to determine exactly how we're going to implement that. But we see that as, in essence, answering that question.

Mr. NELSON. Lest some of you in the audience are getting fidgety, that this is taking much too long, we're covering a lot of ground that we will also cover later in the hearing today, but that we need to cover this ground with the specific Government agencies involved. So a lot of this will have its own special flavor as applied to the witnesses later on, but we have just got to get this all. There will be repetition, but it won't be drug out for the rest of the hearing.

Now, let me go back. Remember I talked about we've got to bring down cost. If we're going to compete against a country like China, the People's Republic of China, that will go out and set a price, whatever it takes, in order to get the launch—and what better example than what drill we've just been through—where the PRC offered it somewhere in the range of about \$35 million for a communications satellite to be launched to orbit. Along comes Ariane. Ariane cuts it by—this isn't exact numbers, but the overall statement of what I'm saying is accurate—cuts it and says we'll do it for \$30 million. And lo and behold, the PRC comes back and says huh uh, you won't. We'll do it for \$25 million.

If we're going to be competitive in that kind of field—First of all, we've got to have an agreement on international pricing and make sure that it is respected and honored by other countries. But at the same time here, we have to do what we've been talking about today, which is bring costs down for commercial launchers. We do that as we've been talking about the actual involvement of the cost of launch.

Now, the other aspect is the cost of the vehicle, bringing that cost down. Now, we put five million in NASA ELV research in the NASA authorization bill in 1991.

I want to ask you, Mr. Frankle, what weight is being given to the suggestions coming out of the Space Launch Act of '88, the recommendations on specific projects that would yield the highest payoff in cost performance and reliability in our R&D on a new generation of launchers? What's being done there by NASA?

Mr. FRANKLE. Mr. Nelson, we've got several different technology programs that are ongoing. The Office of Aeronautics and Exploration Technology has a program involved in their—first just their base R&D program has a fair amount of projects ongoing which relate to launchers. There also is the Civil Space Technology Initiative, CSTI, which relates to that. And, of course, we're funding a fair amount of the effort in the ALS program also to develop technology for the launchers.

I don't—We did submit that report on ELV technology, which I referred to in my statement, to Congress. That program, however, has not been funded and isn't funded, which is somewhat the histo-

ry of the technology programs, since they're not developing something to a specific mission or specific date or a specific program, but just technology for itself, which would then be applied by others. They tend not to do as well.

We have had technology initiatives, CSTI and Pathfinder particularly, over the last couple of years. I would have to check the numbers for the record, if you would like, but I don't believe we've even gotten even half of what the request—We haven't gotten the full request to Congress, and from Congress I think we've not gotten even half. I understand the budget pressures that cause that, but it is a problem which I think needs to be worked so that we can develop these earlier programs and get the technology developed and out and have it in some way somewhat more immune to the funding profiles.

In ALS itself, they're running this year at, between us and DOD, my recollection is the number is somewhat less than half of what the level we had hoped to be at this year. So instead of getting like \$125 million working on that program, we have about \$53- or something like that.

Mr. NELSON. Let me suggest something that you can do this year.

Mr. FRANKLE. Yes, sir.

Mr. NELSON. You're not obligated, under the appropriation bill, to spend the money, but we have authorized \$5 million in the authorization program. That is basically up to NASA. And that money of \$5 million is authorized for R&D on commercial launchers.

Now, you know the feeling of this committee. We want you to take back to your superiors in NASA the strong feeling of this committee and the context in which this feeling is being expressed as a result of this hearing for the sake of our commercial launch industry.

Mr. FRANKLE. Yes, sir. I would have to supply for the record what we're doing with it, the exact \$5 million. I do not know.

Mr. NELSON. Okay.

Bob, do you have any more questions?

All right. Before we go to the next panel, we're going to take a five minute recess, and then we'll start with panel two.

[Recess.]

Mr. NELSON. All right. We're pleased to have our second panel, Charles Lloyd, Vice President and Managing Director, Commercial Launch Services, General Dynamics; Sam Mihara, Staff Director, Marketing Delta Launch Vehicle Division, McDonnell Douglas; Gil Rye, Senior Vice President, Business Development, Orbital Sciences. This panel is to get the perspective of the launch companies.

—Let me ask you all, rather than read a whole statement to us, if you would give us a summary, pretty much if you can, without just reading word for word, because all of your statements have been entered into the record. Then we can get on into the questions from there.

As you see, we've covered a lot of the ground that covers the specific topics that you're going to raise, and we look forward to your valuable contribution. So let's start with Mr. Lloyd.

STATEMENTS OF CHARLES H. LLOYD, VICE PRESIDENT AND MANAGING DIRECTOR, GENERAL DYNAMICS COMMERCIAL LAUNCH SERVICES, INC.; SAMUEL K. MIHARA, STAFF DIRECTOR, DELTA LAUNCH VEHICLE DIVISION, McDONNELL DOUGLAS SPACE SYSTEMS COMPANY; AND GILBERT RYE, SENIOR VICE PRESIDENT FOR BUSINESS DEVELOPMENT, ORBITAL SCIENCES CORPORATION

Mr. LLOYD. Thank you, Mr. Chairman. I appreciate the opportunity, and General Dynamics appreciates the opportunity to be here today. I will attempt to cover my comments. I don't know if I can be as spontaneous and provocative as you and Mr. Walker have been this morning, but I will give it a try.

We think that the whole industry has matured significantly in the past several years. We do think that there is an opportunity for this business to prosper, to generate the type of jobs that we hope, and to provide the benefits on the export side. But as noted, as you noted this morning on Dr. Lovelace's report with the AIA, we do have some concerns. So while we look forward with some optimism to the future, we also have some deep concerns and I would like to touch on those briefly.

But first, I think it's important to get industry's, or at least General Dynamic's, perspective of the past, how industry, the administration and Congress have addressed these issues, in that it may give us some feeling of how we need to look in the future.

First, the industry, certainly the \$600 million plus commitment that the industry has made into this business over the past several years I think is significant. General Dynamics alone has invested \$500 million, entrepreneurially, I would add, although often large companies, their investments aren't viewed as being entrepreneurial, but I can assure you that the \$500 million that we've invested in this business has been entrepreneurial. Of the \$500 million, fully, almost \$100 million has been invested in upgrading the facilities here at the Cape. These are the facilities that were neglected in the '70s and the '80s, and our launch pads—and I know you've been over to our pads and the other facilities that we put in, that's all stockholder funds. That's not Government investment, Mr. Walker, but those are stockholder funds invested in recertifying, and renovating the facilities.

In addition, I would congratulate my colleagues here today. Orbital Sciences, in developing the first, all new commercially developed launch vehicle, Pegasus. I would also congratulate McDonnell Douglas on their 200th launch of their Delta vehicle. I would note our launch, first commercial launch of our Atlas back in July. To date, although that was just our first launch, we have sold some 26, have commitments for 26 commercial launches. We have additional commitments for ten military launches. Of those 26, fully 12 were in direct competition with Ariane. So I think that, although we have a long way to go, we have been reasonably successful in getting business in this very difficult market. I think the industry has selectively modernized its vehicles, and I believe we have brought some creative business terms and conditions to the marketplace.

In terms of the costs, I think if you would look back and examine the cost that the Government purchased its vehicles for previously,

on a pounds-to-orbit basis, the cost to the U.S. Government has been significantly reduced by this commercialization approach. In some ways of analysis, it's been reduced by almost 50 percent.

From the administration standpoint, we certainly appreciate the support of the President and the Vice President. We certainly appreciate the national space policy that was submitted, and we believe that was openly debated and I think it represents a fair solution for all parties. We certainly appreciate both what the DOD and NASA have done relative to, in the specific case of General Dynamics, in the MLV-II procurement, and in the case of NASA, the GOES procurement, and now the SOHO procurement in terms of providing models for commercially buying their launch services. We also certainly appreciate the continued support of the DOT, the DOC, the Office of Management and Budget, the U.S. Trade Rep, and we think they have been very supportive of this industry.

Now, don't take my comments, however, to mean that they do everything, or they do exactly as we say, but I think that all those agencies have been willing to give us a very fair hearing. And when these decisions are made on these complex issues, I think that the Executive branch, by and large, has been willing to listen to us and to listen to our story.

I think, from the standpoint of the Congress, I think the Congress has been very supportive. I think their support has been very strong, I think it's been very fair, and it's been very consistent.

I would, in particular, however, like to thank Senators Hollings, Gore and Heinz, and Congressmen Roe, Solomon, Packard and, of course, yourself and Mr. Walker. Those individuals I think in particular have been supportive of the industry and the thousands of workers that this industry represents.

Specifically, the Congress, I think that the NASA authorization bill was very good relative to our industry. I won't read out of the statement, but I have listed some five of your policy statements. I will read one. It supports the sustenance of a mixed fleet, utilizing both commercial and government vehicles to the fullest extent practical. So I think those policy statements that you provided in the NASA authorization bill I think are very appropriate and lay out the direction for our industry.

We also appreciate the support, continued support, that that bill showed for the Office of Commercial Space Transportation, the National Space Council, and the Office of Space Commerce over at the Commerce Department. I would also point out that your continued emphasis on the space shuttle use policy has been instrumental in revitalizing this particular industry.

In addition, Title II, we think that was most appropriate and, as it relates to General Dynamics, what the title II means, is buying commercially. What that means to us is that you buy, the Government buys, our commercial customers buy, off of a long-running production line in which we control the specifications of the vehicle. You know, there's been a lot of discussion about what commercialization is. But in this business, it's buying off of a single production line, a production line that we control. I think the title II very appropriately identified those things and we're very supportive.

However, we also support the provisions that allow the various agencies of the U.S. Government to take the proper oversight and insight as it relates to the individual procurements.

We also appreciate what the Congress has done relative to the Chinese Long March situation. I know you and your colleagues have been very active there.

We think that the past several years have been a good example of the Executive branch, industry and Congress working together to solve those particular problems as it relates to the access to space, but as I mentioned there, we believe there are still some critical issues. We think there are some improvements that certainly can be made. We all know, I think, what those issues are. I think Mr. Mihara is going to delve into those issues in a little more detail relative to Government inducements and unfair trade practice and that sort of thing.

But what I would like to do is just spend a couple more minutes talking about three or four specific things that I think the Congress, the next Congress can do that really—we're not talking about a lot of money here, but I think we are talking about a lot of vision and leadership.

First, the issue with the PRC. The Congress, I think, was very wise, as a part of the Export Administration Act, putting in a provision that the U.S. Trade Rep would have to certify that the PRC was living up to its agreement. Unfortunately—and I think perhaps for other reasons—the President vetoed that bill. We believe very strongly and urge the Congress to repass those provisions that were included in the Export Administration Act relative to the PRC.

The second thing is involved in the stability and enforcement of the brand new national launch policy. You will find it I think very troubling that—I, of course, travel around a lot; my job is to sell launch vehicles. In the course of my travels over the past month, customers have told us that the Soviets are saying that not to worry about the current policy, we'll be able to launch western satellites out of Russia within a couple of years. And when these customers ask them and say but isn't that a conflict with the just recently passed—just recently established policy—the Soviets have told them not to worry, that policy is going to change because obviously those policies aren't really set in concrete, and we're going to be able to launch U.S. satellites out of Russia in the early '90s.

I find that very troublesome. I think that it's clearly a violation of the new policy, and I think it is very disruptive in the marketplace.

As it relates to the policy, we strongly support the policy. Dr. Lovelace, my boss and I and other General Dynamics folks have been going through Washington for the past year saying we almost don't care what the policy is; just give us a policy. That's the only way that we can really run a business, is if we have a stable policy in which to run that business. Not only do we need a stable policy; we need stable requirements as it relates perhaps to the heavy lift. You can talk about stable requirements.

But I would urge the Congress to solidify the recent policy with some legislation. I know that perhaps that may run counter to some thoughts currently, but we believe very strongly that the na-

tional space policy that was just recently put out needs to have some legislation to solidify it.

We have talked a little bit about vehicle technology. And you point out with the first panel the \$5 million. We think that some funding relative to vehicle technology can be very supportive. The COMSTAC has prepared a report, and I'm sure your staff has seen it, relative to—that commented, on the NASA component technology plan, and we think there are certainly things, propulsion and some other areas, that can be very supportive.

We would certainly urge the Congress to take these actions in its next session. We think that the amount of money involved is very small, but the amount of leadership is very large.

Relative to the AIA study, we do not at this point believe that a commercial spaceport solely for the medium and heavier vehicles would pay at this time. However, we certainly believe that this should continually be looked at.

We do, however, believe that the concept, perhaps the concept of national ranges, perhaps the concepts of the DOT and some other funding being available, might be appropriate. We also think that the Florida Spaceport Authority can play a very strong role. It's actually working with General Dynamics relative to some bonding issues and specific facilities. So we think that those things are very appropriate.

In closing, I would simply urge the committee to consider the thoughts that we've talked about this morning. We believe that we have made a significant investment in this industry. We are looking for a stable policy, and we are looking for the next Congress to continue their support.

I would add, as several other witnesses have added, that, Mr. Chairman, we appreciate your support over many years to this industry, and we certainly wish you well in the future.

Thank you very much.

[The prepared statement of Charles H. Lloyd follows:]

Testimony of
MR. CHARLES H. LLOYD
GENERAL DYNAMICS CORPORATION
on the
COMMERCIAL EXPENDABLE LAUNCH VEHICLE INDUSTRY
to
SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS
U.S. House of Representatives
30 November 1990

Mr. Chairman, Members, I appreciate the opportunity to appear before your subcommittee today and offer my views of the issues affecting the commercial expendable launch vehicle industry. The industry in general, and General Dynamics in particular, have matured significantly in the last several years, experiencing a number of successes as well as a few failures. Overall, we feel the industry has the potential to grow and flourish, creating thousands of jobs for our domestic work force, contributing to the nation's economy, improving the balance of trade and strengthening the nation's presence in space. While General Dynamics and others have thus far realized some successes, we at General Dynamics look to the future with both optimism and deep concern. Frankly, this fledgling industry is faced with a number of critical issues that threaten its very survival.

Before I discuss these critical issues, however, I would like to review the positive actions that have been taken by industry, Congress, and the Administration as it relates to the Commercial Launch Industry:

First, the actions of American industry. These would include the following:

- The commitment of substantial stockholder funds to the launch industry -- over \$600 Million -- during the past several years. These funds have been used to upgrade and modernize the launch vehicles, renovate launch facilities, and produce new and modern engineering and production facilities.
- The development of the first all new commercially developed launch vehicle, the Pegasus by Orbital Sciences Corporation.
- The successful launch of the 200th Delta launch vehicle by the McDonnell Douglas Corporation.
- The first commercial launch of an Atlas launch vehicle in July of this year, which represented the first of more than 60 planned launches by General Dynamics in the 1990s.
- The selective modernization of certain elements of the Titan, Delta, and Atlas that have helped revitalize these "old" launch vehicles and have made them relatively competitive against the present ESA/Ariane launch vehicle.

From the standpoint of the Congress, there has been strong, consistent and fair support for our industry. In particular, I would express my appreciation to Senators Hollings, Gore, and Heinz and Congressmen Roe, Solomon, Packard and of course, you Mr. Chairman and Mr. Walker and other members of your Committee. Their efforts on a wide variety of issues are greatly appreciated by the many thousands of workers in our industry.

Specifically, the Congress has been supportive in the following areas:

- The passage of the 1990 NASA Authorization Bill was a strong inducement for the U.S. space effort and the U.S. launch industry. In particular, I refer to parts of Section 102 of the Bill which states:

"It is declared to be national policy that the United States should:

- (1) rededicate itself to the goal of leadership in critical areas of space science, space exploration, and space commercialization;
- (2) increase its commitment of budgetary resources for the space program to reverse the dramatic decline in real spending for such program since the achievements of the Apollo moon program;
- (5) forge a robust national space program that maintains a healthy balance between manned and unmanned space activities and recognizes the mutually reinforcing benefits of both;
- (7) sustain a mixed fleet by utilizing commercial expendable launch vehicle services to the fullest extent practical;
- (8) support an aggressive program of research and development designed to enhance the United States preeminence in launch vehicles;"

The statement of this policy by Congress lays out the direction that space transportation should take in the United States.

- In addition, the NASA Authorization Bill authorized continuing funding for the Office of Commercial Space Transportation, National Space Council, and the Office of Space Commerce. Further, it reaffirmed the Space Shuttle Use policy that has been instrumental in re-establishing our country's assured access to space.

- Also, included in the NASA bill was the Title II provision, which correctly identifies the advantages of economics of scale and other cost savings that commercial type launch vehicle procurements allow. In particular, we support the sense of Congress to buy in a commercially reasonable manner. To General Dynamics, this means buying off a single production line with the company controlling the basic vehicle configuration. We do support, however, the provision that allows government agencies to meet their obligations to the taxpayer by providing for the insight and oversight appropriate for each individual procurement.
- There have been a number of initiatives in Congress that have addressed the issue of the launch of Western satellites on Chinese launch vehicles. Most of these efforts have focused on implementation of the U.S./Chinese launch agreement. These efforts on behalf of the industry and its workers have been most appreciated.

These past three to four years have been a positive example of Industry, the Executive Branch, and Congress working together to meet national goals as they relate to space transportation: Industry making the needed investment and lowering the cost of space transportation, the Administration setting the policies, and Congress providing significant leadership and direction.

So, if all is well -- what are these critical issues I raised earlier? Most of these are well known and much discussed -- access to the market by non-market economies, foreign subsidies and inducements, the need for improvements to U.S. launchers, various range issues, and access to the U.S. Government market. I would like to speak to several specific issues that we believe need to be addressed in the next Congress. We believe these proposed actions can be accomplished at minimal cost to the taxpayer.

First, the issue of assuring that the People's Republic of China adheres to the U.S./PRC Trade Agreement for placing U.S. satellites on the Long March vehicle. The Congress passed a bill which stated that export of U.S. satellites to China was prohibited unless the U.S. Trade Representative verified that China had conformed to the terms of the agreement in each particular case. Unfortunately, the President vetoed this bill. The President has directed some administrative actions, which may be helpful, but we would urge the Congress to pass legislation that would have the same intent as this section of the vetoed bill.

A second concern is the stability and enforcement of the brand new commercial launch policy. We have been told by our customers that the USSR is saying the policy will change to allow them to launch Western satellites out of the Soviet Union by 1993. This is clearly in violation of the new policy and highly disruptive in the marketplace. We have also been told that the Soviets have been very disappointed with other provisions of the Policy and are attempting to get it changed in the current round of negotiations. We strongly support the President's policy and believe it to be a fair treatment for all parties. We would urge the Congress to take action to solidify the policy and to establish the enforcement mechanisms that will ensure its implementation. A stable policy is absolutely critical to this industry in its ability to acquire a fair return on its invested capital and to provide the most reliable and cost effective services to its customers.

Another issue is that of vehicle technology. In the near future, the U.S. commercial industry will have to compete against new vehicles such as the ESA Ariane 5, the PRC Long March 2E, the USSR Zenit, and the Japanese H-2, whose developments are completely paid for by national funding. No such new vehicle is currently planned in the United States. As a result, there is an urgent near-term need to infuse advanced technology into the U.S. launch vehicles to strengthen our competitiveness. Without such vehicle technology improvements, there is little chance to remain competitive in the near term against such new vehicles. Further, there is a long-term need for new U.S. launch vehicles.

The Commercial Space Launch Act Amendment of 1988 called for NASA to develop a Component Technology Plan aimed at providing a mechanism to implement new technologies which will increase the competitiveness of U.S. commercial ELVs. Industry presented recommendations for specific projects yielding the highest payoff in cost, performance, and reliability. No action has been taken by NASA due to the lack of enabling legislation language in the NASA Authorization Bill.

In a similar vein, the Defense Science Board in its 1989 Summer Study of National Space Launch Strategy, was impressed by the propulsion, vehicle, and automated processing technology efforts supported by the Advance Launch System (ALS) program. The report recommends a launch vehicle strategy that continues investment in advanced propulsion and vehicle technologies and supports product improvement of current vehicles.

We urge Congressional support for overcoming the inertia involved in modernizing the nation's ELV fleet.

Mr. Chairman, one final issue is very close here to your home. This summer, Secretary Skinner asked the Aerospace Industries Association to conduct a study to determine the infrastructure needs of the commercial launch industry. This study was chaired by my boss, Dr. Alan Lovelace. It was concluded that a stand-alone commercial spaceport may be needed sometime in the future, but for now, the prime need is for modernizing and upgrading the Eastern Test Range, which has become somewhat antiquated. The funds needed are substantially greater than historic levels allocated by the Air Force. The Department of Transportation, which has responsibility for infrastructure requirements for other forms of transportation, may be able to contribute additional funding support. Additionally, there seems likely to be a role for the Florida Spaceport Authority in developing the needed infrastructure. We urge Congress to recognize the need for this national spaceport and its importance to international competition as funding requests of DoD and DoT are considered in the coming budget cycle.

In closing, I respectfully urge the committee to consider the ideas presented today. We believe they represent a relatively small amount of funds but a large amount of congressional vision and leadership. We in the industry have made a significant investment in the country's space future. I am only asking the next Congress for their continued support.

Mr. Chairman, I know you will not be sitting in the next Congress. General Dynamics wants to thank you for your very strong support of the industry and the national space program over a substantial number of years, and we wish you good fortune in your future endeavors.

Thank you.

CHARLES H. LLOYD

Prior to joining General Dynamics in 1980, Mr. Lloyd worked for Ford Motor Company, where he had varied financial assignments in the Ford Division, Ford Parts and Service Division, and the Corporate Financial Staff.

He began his career with General Dynamics in the Corporate Office as Manager of Financial Planning-Aerospace, and was later promoted to Director-Financial Planning-Commercial.

In early 1984, Mr. Lloyd joined General Dynamics Services Company. In 1986, he was appointed Division Vice President, Administration and Controller, for GDSC. In this capacity, Mr. Lloyd had responsibility for the controllership, contracts and estimating, procurement and facilities functions for the company.

Mr. Lloyd joined Space Systems Division as the Division Vice President and Controller in October of 1986.

In August 1989, Mr. Lloyd was promoted to Vice President and Managing Director for General Dynamics Commercial Launch Services, Inc.

He holds a Bachelor of Science Degree in Finance from Virginia Tech, and a Master of Business Administration Degree in Finance from the University of Michigan.

Mr. NELSON. Thank you, Mr. Lloyd.

Mr. Mihara.

Mr. MIHARA. Thank you, Mr. Chairman, and Mr. Walker, and to the members of the Subcommittee on Space, Science and Applications for this invitation to testify on the status of the U.S. commercial launch industry. My name is Sam Mihara. I am Staff Director in the Delta Launch Vehicle Division of McDonnell Douglas.

Before I begin, I am compelled to state that this has been the most exciting week in my 34 years in the space business. Last Sunday, my daughter, who is an engineer on the Space Station program, blessed us with a first grandchild. On Monday we had the first of a new generation of Delta launch vehicles successfully launched on an Air Force GPS NAVSTAR satellite, which for the first time will give 24 hour coverage in Saudi Arabia for position locating for our troops. On Tuesday and Wednesday, in Washington, I heard from very senior members of the administration, very positive words of support for the comments and policies and suggestions I will be making today. And today I am culminating the week by being able to testify here. So I appreciate that opportunity very much.

Mr. NELSON. And Saturday night, hopefully Columbia will launch heavenward.

Mr. MIHARA. Absolutely.

I plan to keep within the allotted ten minutes and, with your permission, I would like to begin by showing a very short videotape of some of the recent accomplishments on Delta and what we have learned. So, with that, if I may have the videotape turned on, please.

[Video Presentation.]

There are seven launches shown in the sequence. I'll keep my comments to a minute so you'll be able to enjoy what we have learned.

The first one is for SDI. It was called Delta 181, as soon as the video comes up. But continuing on, this is for SDI and included multiple sensors from which we gathered extremely important data on target signatures.

The second one is a Delta Star mission. Here we go. And that one you just saw was the first SDI experiment to track a rocket booster, and it was a very important experiment.

That mission you're seeing now is a ROSAT, a joint NASA, U.S. and German experiment, the first ten-foot fairing, and it measured x-rays in deep space. The Indonesian mission was a very important one because it linked together for the first time the 13,000 islands that make up the Nation of Indonesia. You may recall that was a satellite recovered by Astronaut Joe Allen with a shuttle system.

The next one is a unique launch. It was from California, and it was the COBE mission. We're still looking at the Indonesian mission right here.

Some excellent optics. It was interesting. The optics is partly due to the result of the Challenger accident, where the value of very high-resolution optics was useful. It shows what can be done these days in terms of being able to diagnose. Here we have some very excited customers from Indonesia.

This is still what we call—what some people refer to as the Delta I, but it's the 8-foot configuration all the way to the fairing. Here you see the solids coming off. This is the type of tracking that we're very grateful to the range for being able to provide this type of quality.

There you see the last of the nine solids coming off. All of our missions here have been very, very successful.

This next one is an interesting one. This is a polar launch from Vandenberg called COBE. It was for a NASA scientific mission, and the major learning from this mission was that we were able to confirm that the so-called "big bang" theory on the evolution of the universe was confirmed with the spacecraft from this Vandenberg launch.

We also learned how to live with the environment because we hung on to the solids after burnout until it cleared the Channel Islands off of California. It made the people in Santa Barbara very happy about that.

The next sequence you'll see is our very first Air Force Delta II. It's the first of the series of NAVSTARS. GPS was a very important program for us. It provided for the new, nine-and-a-half foot fairing, which we'll be seeing very shortly.

We have a series here of 18 under the current contract, and we just completed number 10 last Monday. We have eight more to go in the current family. It does illustrate the point of how we are able to intermix the commercial and the U.S. Government missions on a very efficient basis, and we want to maintain that mix and capability so that both the U.S. Government and the commercial users can have the benefits of an efficient launch operation.

You can see the first stage tanks were increased in length by 20 feet to handle more propellant, and the fairing was larger. All of these missions were very successful.

The last mission is number 7 here, you will see in a moment, and that was for India, for the India Satellite Organization. And the significance there is it brought television and communications to 500 million people in India, a very rewarding experience for both their government and our customers.

What's interesting is the ground optics picked up the rocket. Here's the Delta. And at the very last sequence here it ran across the moon. And so we sent a photo of that to India and they're very happy with it.

So thank you very much for the opportunity to show you those videos.

[End Video Presentation.]

Again, in the interest of time, I would like to summarize my written statement and just speak to the most important parts of the paper, which is in the record.

The commercial launch market, which appeared plentiful when expendable launch vehicles were sought out as an alternative to fill the void left in the wake of the Challenger accident, is now shrinking. The post-Challenger bow wave has crested and will dissipate entirely by 1994.

While the commercial launch market has been shrinking, the number of competitors has increased. The international commercial competition has intensified further as the nonmarket-based

suppliers—namely, the PRC and the Soviets—seek to enter the marketplace. And U.S. launch providers can expect further, more commercial competition from the Japanese, from other possible market economy entrants like Brazil, Israel, and India. And by the end of the century, we expect that there will be no less than seven, and maybe as many as ten competitors all going out after this very, very limited commercial launch market. We are now forecasting the market for the late '90s at about 12 launches per year, and so we're talking about maybe up to as many as ten suppliers going after that size of a limited market.

But the problem doesn't end there. The problem includes the fact that there have been an increasing number of concerns for foreign pricing and foreign trade practices. And I'll give you a few examples.

In the BRAZILSAT competition, Arianespace offered to transfer restricted rocket engine technologies as part of their bid, which we feel may be in violation of the Missile Technology Control Regime.

Mr. NELSON. That was in which competition?

Mr. MIHARA. That was in BRAZILSAT competition. It was solicited by Brazil. Under the rules of the MTCR, we were not allowed to and we did not include a rocket engine or technology bid, but it was included in the Arianespace proposal. The PRC won the ARABSAT competition with a bid that was acknowledged to be 50 percent below that of the U.S. offers, apparently violating a memo of agreement with the U.S. to price on a par with western offers. In Indonesia, the Soviets made an offer to launch at no cost.

Early this year, President Bush ordered the National Space Council, led by Vice President Quayle, to review the existing national space policy in order to formulate a comprehensive commercial space launch policy that would effectively deal with such issues as existing trade agreements, restricted technology transfers, and non-proliferation of missile technology.

In our view, as a U.S. commercial launch supplier, the directive represents a first step in the right direction toward ensuring fair market practices for the international commercial launch market. More steps in that direction, however, will mean greater strides towards achieving the stated national goal of low-cost, assured access to space.

Steps are needed to ensure that U.S. launch manufacturers, who are competing in the marketplace without the benefit of direct U.S. Government subsidies, are not placed at an unfair disadvantage when competing against the Government-run and funded agencies that do not operate under similar constraints.

One solution through effective legislation was that Congress recently proposed such a reasonable solution, which was the Export Administration Act of 1990. On Friday, November the 16th, the President vetoed the export bill, leaving further actions to the 102nd Congress.

There is a tremendous imbalance between actual costs incurred by the U.S. and those costs incurred by the PRC and the Soviets. Given this large imbalance in the cost of labor and the cost of living, there is little possibility that U.S. launchers will be competitive on cost.

In lieu of fair pricing agreements, other areas may prove to be more agreeable and more enforceable. Serious consideration must be given to limiting the number of commercial launch contracts allowable for the nonmarket providers per year, even if they launch from other countries. Keep in mind that the market is already small, and a quantity of one is a large number. To make such an agreement more enforceable, the U.S. commercial goals could be coupled with other interests of the nonmarket providers, such as limiting access to U.S. markets unless they open up their market to us.

In the event there are violations of agreements, other examples of enforcement include withholding export licenses for satellites. Also, the future quota for the number of launches allowed for each violation should be reduced by a factor of two for each violation. Whatever form such agreements may take, they must ensure a commercial market in which U.S. providers can remain competitive and profitable.

Some competitors have had great success employing an industry and government team approach to improving launch services. For example, we heard that the government supporting the European Space Agency have invested \$4.8 billion to develop the Ariane V. The Japanese government has invested \$5.2 billion to develop the H-II vehicle and launch facilities for commercial and domestic civil launches.

In contrast, investments in the U.S. commercial launch products are made by individual companies at very high risk. My company, McDonnell Douglas, took a gamble and invested \$100 million in a new stage called PAM D-II for the shuttle application. When commercial payloads were removed from the shuttle, McDonnell Douglas lost its investment. General Dynamics, Martin Marietta, and many other new start launch companies have also made large investments, and all have been disappointed in the lack of reasonable returns on those investments. The U.S. companies, therefore, are no longer willing to risk these investments in a high stakes gamble with little prospect of a reasonable return. What is needed is an investment, an investment that will not only aid U.S. commercial missions but will also benefit U.S. Government missions, both military and civil. The same Government investment could provide payoffs then to both defense and commercial missions.

In 1988, Congress directed NASA to identify technologies that would reduce these costs and improve reliability and performance. The "Expendable Launch Vehicles Technology Report" that was released last July provided the right type of answers. It reviewed and assessed those technologies and named five technologies of most importance, and they included propulsion, materials, structures, avionics and operations. We agree with and certainly endorse this report.

What we're saying is that the Government and industry need to work together to find and fund the innovative new technology solutions needed for the future.

In summary, the President has initiated a new national space policy and outlined a challenging vision of America's future in space. The challenges we face today are mostly the economical challenges of investing in those industries and businesses who can

best develop those technologies to their fullest, to the benefit of all users, both Government and commercial. And we must ensure that fair market practices are implemented that will maintain a balanced and competitive market in which the U.S. industry can survive.

Thank you very much.

[The prepared statement of Samuel K. Mihara follows:]

STATEMENT BY
SAMUEL K. MIHARA
DELTA LAUNCH VEHICLE DIVISION
MCDONNELL DOUGLAS SPACE SYSTEMS COMPANY

BEFORE THE SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

NOVEMBER 30, 1990
KENNEDY SPACE CENTER, FLORIDA

Thank you Mr. Chairman and the members of the Subcommittee on Science and Applications for the invitation to testify on the status of the US commercial launch industry. My name is Sam Mihara. I am Staff Director in the Delta Launch Vehicle Division of the McDonnell Douglas Space Systems Company.

Recent History

The nature of the US commercial space launch business has been changing as rapidly and dynamically as changes in world events over the past year. The commercial launch market, which appeared plentiful when expendable launch vehicles were sought as an alternative to fill the void left in the wake of the Challenger accident, is now shrinking. The post-Challenger bow wave has already crested and will dissipate entirely by 1994. This is partly because the current demand is being filled. Also some proposed projects have been unable to secure financing because of the high cost of communications systems.

While the commercial launch market has been shrinking, the number of competitors has increased. Immediately after the Challenger accident, the European Ariane captured a large share—sixty percent—of the existing market during the two years it took US commercial launchers (McDonnell Douglas, Martin Marietta, and General Dynamics) to market, build up, produce, and launch their first rocket. International commercial competition has intensified further as the non-market based suppliers, the PRC and the Soviets, seek to enter the marketplace. And US launch providers can expect future commercial competition from the Japanese and other possible market economy entrants such as Brazil, Israel, and India. By the end of the century, no less than seven—and possibly as many as ten—suppliers will be competing for a very limited commercial launch

market, which has been forecasted for the late 90s at about twelve launches per year, compared to the current level of twenty launches per year.

Furthermore, the problem of a shrinking world market for an increasing number of launch suppliers has been compounded by foreign pricing and trade practices. For example on the BRAZILSAT competition, Arianespace offered to transfer restricted rocket engine technologies as part of their bid--which may be in violation of the Missile Technology Control Regime. The PRC won the ARABSAT competition with a bid that was acknowledged to be fifty percent below that of US offers, apparently violating a Memorandum of Agreement with the US to price "on a par with" Western offers. In Indonesia, the Soviets made an offer to launch at no cost.

In every instance, US commercial launch suppliers protested these tactics immediately, calling upon the US government to take some action to help ensure fair market practices for the international commercial launch market. It is likely that all US commercial launch suppliers will be forced out of the world's commercial launch business if some "rules of the road" are not developed and enforced to ensure a free and fair market, or "level playing field," in which the US can compete on a reasonably fair and equitable basis.

National Space Policy and Legislation

In the aftermath of the ARABSAT issue, the US government's positive response to the situation —such as confronting the PRC with the alleged violation—was appreciated by the industry. Early this year, President Bush ordered the National Space Council led by Vice President Quayle to review the existing National Space Policy in order to formulate a comprehensive Commercial Space Launch Policy

that would effectively deal with such issues as existing trade agreements, restricted technology transfers, and non-proliferation of missile technology.

On September 5, 1990, the President approved the new National Space Policy Directive. This new policy recognizes the many benefits the commercial space launch industry provides to the United States, including its indirect benefits to US national security, and establishes the long-term goal of a market in which US industries can compete. The policy states near-term goals, which include trade agreements and their enforcement to limit unfair competition, and ensures the continued use of US manufactured launch vehicles for launching US government satellites. The policy also "encourages" technical improvements that will reduce the cost of access to space and increase the reliability of US space launch vehicles.

In our view, as a US commercial launch supplier, the directive represents a first step in the right direction toward ensuring fair market practices for the international commercial launch market. The new commercial space launch policy acknowledges the problems facing the US commercial launch suppliers in the international marketplace and takes the much needed first steps toward ensuring US presence and competitiveness in that market. More steps in that direction, however, will mean great strides toward achieving the stated national goal of low-cost, assured commercial access to space.

Solutions to the Pricing Problem

Steps are needed to ensure that US launch manufacturers, who are competing in the marketplace without the benefit of direct US government subsidies, are not placed at an unfair disadvantage when competing against government run and funded agencies that do not operate under similar constraints. To protect US commercial

launch interests in the international market, we need tough and enforceable trade regulations that allow no room for misinterpretation by the nonmarket players. Agreements such as the MOA with the PRC are meaningless if they are not enforced or are unenforceable due to differences in interpretation on both sides. The ARABSAT issue needs to be quickly and firmly resolved. A good precedent for fair market practices is needed now.

One solution is through effective legislation. Congress recently proposed such a reasonable legislative solution, the Export Administration Act of 1990. The Export bill contained language requiring case-by-case certification by the USTR that any competition involving the PRC and a US company complies with the current Memorandum of Agreement between the two countries. On Friday, November 16th, the President vetoed the Export bill, leaving further actions to the 102nd Congress.

The apparent impasse on the pricing issue with the PRC illustrates the kinds of fundamental differences that must be considered as we negotiate a workable trade agreement for the international commercial market. There is a tremendous imbalance between actual costs incurred by the US and those incurred by the PRC and Soviets. They say they are being fair and compliant with the MOA, basing their bids on recovering cost plus reasonable profit, just as we do. However, their labor costs are much lower than those of the US and the cost of living for their labor force is heavily subsidized by the government. Given this large imbalance in the cost of labor and the cost of living, there is little possibility that US launchers will ever be competitive on cost when bidding against the nonmarket economies based on a cost plus reasonable profit formula.

In addition, a "transitional phase" may be required in our relations with nonmarket countries on such economic issues. It is unrealistic to expect the PRC or the Soviets to make a one-step functional change to capitalistic behavior overnight. However, we must take steps to enforce the existing US-PRC agreement to ensure that future agreements will be adhered to by both parties. It won't be easy and it will take a lot of work before we (the PRC and US) are clear as to what we have actually agreed to in the MOA "on a par with" pricing proviso.

In lieu of "fair pricing" agreements, other areas may possibly prove more agreeable and more enforceable. Serious consideration must be given to limiting the number of commercial launch contracts allowable for nonmarket providers per year (or other given time period), even if they launch from other countries. Keep in mind that the market is already small, and a quantity of one is a large number. Placing a limit on the access to the market offers an enforceable and easily measurable way of ensuring compliance. Limits on quantities also represent our best chance for striking a fair and cooperative agreement. To make such an agreement more enforceable, US commercial launch goals could be coupled with other interests of the nonmarket providers—such as limiting their access to US markets, unless they open up their market to us.

Any regulation must be fair and consistent and be easily understood and accepted by all parties to reduce the likelihood of reneging on the agreement by claiming to a misunderstanding or misinterpretation of any terms and conditions. Provisions

are needed to ensure effective and enforceable sanctions, which must be strictly enforced for any and all violations, and binding force for all participants. And penalties must be severe enough to discourage and prevent violations in the first place. For examples, export licenses should be withheld for satellites and the future number of launches for the violator should be reduced by a factor of two for each violation. Whatever form such agreements may take, they must ensure a commercial market in which US providers can remain competitive and profitable.

Future Investments

The competing foreign vehicles—the Ariane, the PRC's Long March, the Soviet Union's launchers, and the Japanese HII family—have some distinct advantages. Rather than being derived from vehicles designed to more costly military specifications, which is essentially what happened in the US, their launchers have been designed specifically for delivering commercial and civil payloads to orbit. They launch from government bases well suited to commercial operations.

Some competitors have had great success employing an industry-government team approach to improving launch services. For example, the governments supporting the European Space Agency has invested \$4.8 billion to develop the Ariane V. The Japanese government has invested \$5.2 billion to develop the HII vehicle and launch facilities for commercial and domestic civil launches.

In contrast, investments in US commercial launch products are made by individual companies at very high risk. McDonnell Douglas took a gamble by investing \$100 million in a new stage called PAM D-II for Shuttle applications. When commercial payloads were arbitrarily bumped from the Shuttle manifest after the Challenger accident, McDonnell Douglas Corporation lost its investment. General Dynamics,

Martin Marietta, and many other "new start" launch companies have also made large investments—and all have been disappointed in the lack of reasonable returns on those investments to date. Because of the high risk factor involved and tightening aerospace budgets, US companies are no longer willing to risk investments in a high stakes gamble with little or no *real* assurance of reasonable returns.

The long-term solution for US launch providers—to reach a competitive position in the international market—will be for us to become cost competitive in the commercial market. We must begin to develop and take advantage of the technologies that will reduce costs, raise performance levels, and provide more efficient launch operations. There are precedents in other industries that have remained competitive by innovating and applying new ideas. It is tougher for the US launch industry to seek out the low-cost solutions without government support.

The Commercial Space Launch Policy has stated that "the United States should take action to encourage technical improvements to reduce the cost and increase the reliability of US space launch vehicles." From the point of view of the US commercial launch community, encouragement is fine, but it is intangible. What is really needed is an investment — real dollars to develop the technologies that are required to improve launch economy, reliability, and performance; an investment that is relevant to the government's stated goals for economical launch services and a competitive domestic launch vehicle industry; an investment that will not only aid US commercial missions but will also benefit US government missions, both military and civil. The same government investment could provide payoffs to both defense and commercial missions.

The Role of Technology

In 1988, Congress directed NASA to identify technologies that would reduce initial and recurring costs, increase reliability, and improve performance of expendable launch vehicles for government and commercial launch missions. The "Expendable Launch Vehicles Technology Report" released in July reviews and assesses ELV technologies in five areas that account for the major percentage of ELV costs: propulsion, materials, structures, and avionics and operations.

For the potential propulsion effort, the report describes an approach to low-cost engine design and development technology and what is needed to focus increased emphasis on low-cost launch systems using liquid oxygen/hydrogen propulsion, liquid oxygen/hydrocarbon propulsion, solid propulsion systems, low-pressure booster propulsion, or upper-stage propulsion technologies. The report also identified the need for operational propulsion test facilities to support the development of these low-cost engine technologies.

The report identified the types of composite structures and materials that could be developed to reduce weight and costs and increase reliability and performance, as well as the processing, fabrication, and manufacturing methods required to produce the composites.

Finally, the report also identifies avionics and operations technologies that can benefit both government and commercial ELVs by reducing costs while increasing safety, reliability, and flexibility.

We agree with and endorse this report, which accurately reflects the necessity of a continuing research and development program in critical launch vehicle

technologies that will be mutually beneficial to government and commercial launch missions, a program that is essential to the survival of a competitive domestic launch industry to serve these missions. With the proper investment now, these technologies can be developed for next-generation vehicles with improved launch performance, increased safety and reliability, reduced costs, and more efficient launch operations.

Traditionally, the risk and burden of investment for technological advances has been put on the supplier, who takes the gamble hoping to realize a profit if and when a government contract can be secured. But in an era of shrinking aerospace budgets, the risk has gotten too high and the burden too great for the US launch industry to bear alone. Government and industry need to work together to find and fund the innovative new technological solutions needed to meet future cost-performance requirements that will benefit all launch vehicle users. Government-industry partnerships such as the Commercial Space Transportation Advisory Committee (COMSTAC) are already in place and working, so we know this kind of teaming arrangement can work. One example of COMSTAC's efforts is the recent report with recommendations for new technologies and component development.

Summary

In summary, the President has initiated a new National Space Policy and outlined a challenging vision of America's future in space. The challenges we face today are mostly the economical challenges of investing in those industries and businesses who can best develop those technologies to their fullest and to the benefit of all users, government and commercial. And we must ensure that fair market practices

are implemented that will maintain a balanced, competitive marketplace in which the US space industry can survive.

Thank you very much.

Mr. NELSON. Thank you, Mr. Mihara.

Colonel Rye.

Mr. RYE. Thank you, sir.

Mr. Chairman, Mr. Walker, thank you for the opportunity to appear before you today. I would like to give you just a very brief summary of my more extensive remarks, which have been provided to you separately.

OSC was founded in 1982 and has been one of the fastest growing companies in the United States during the past eight years. OSC is perhaps best known for two of our commercially-developed space launch systems: the Transfer Orbit Stage and the Pegasus Air-Launched Space Booster, which we successfully launched on April the 5th of this year. In these projects and others, Government participation in OSC's programs have been essential. I believe that, together, the OSC and the United States Government have done things right in commercial space and that our mutual success provides a model for government/industry cooperation.

Our company is headquartered in Fairfax, VA, and provides low-cost access to space with a wide variety of advanced-technology space products. OSC employs over 700 people and had revenue in 1989 of approximately \$80 million.

Recently, Orbital became the first commercial space company to conduct a public stock offering, which was successfully concluded on April the 24th of this year.

OSC's Pegasus air-launched booster was successfully launched for the first time on April 5th, after deployment from a NASA carrier aircraft over the Pacific Ocean. Pegasus uses an innovative air-launched approach for placing small satellite payloads into orbit at low cost, and is the first all new, unmanned launch vehicle to be developed in the United States in 20 years. More importantly, the Pegasus flight marks the first time a privately-developed space launch vehicle has carried a payload into orbit.

Mr. Chairman, you asked that we comment today on the suitability of Government range operations for commercial launches. OSC's experience with Government ranges has been good. In general, they are enthusiastic about supporting commercial launches and we found that the interaction with the range can benefit our programs. For example, while the process of safety reviews and requirements imposed by the Vandenberg range for the Pegasus launch were stressful, in the end we believe we had a safer, more reliable vehicle.

We believe commercial spaceports offer significant potential. I am pleased to inform you today that Orbital Sciences is currently in negotiations to launch the first rocket to leave the Earth from Florida's new spaceport facility next year. We anticipate that OSC will conduct the first six launches for Spaceport Florida, each one a suborbital rocket providing ten to fifteen minutes of microgravity for university research projects. OSC will be on the ground floor of establishing range safety documents and assisting in every aspect of setting up the range for Florida's exciting endeavor.

Mr. Chairman, the U.S. commercial space launch industry literally took off in 1990, providing an optimistic start for the decade to come. Seventeen commercial U.S. launches are listed on the Department of Transportation manifest for 1991, and nearly half of

those will be conducted by OSC, more than any other launch company.

There is a new way of doing business in space that is now emerging in industry. In the launch vehicle industry, businesses now sell launch services to orbit instead of selling launch vehicles. New programs are being funded with privately-raised capital, increasing both the risk and potential rewards to companies. In such an environment, national space policy must provide long-term stability and consistency.

Mr. Chairman, there is one area of increasing concern to OSC, and that involves the potential retention and reuse of excess strategic ballistic missiles as space launch vehicles. We understand that the current U.S. negotiating position on the START treaty calls for the retention of strategic ballistic missiles that become excess to requirements rather than destroying them, as is being done on the INF treaty. The argument commonly used for retention of these assets is that the United States Government will save significant sums of money by reusing the missiles for launching satellites into orbit. We are concerned because of the potential damage to companies like ours if the disposition of these assets is not handled fairly and equitably.

It should be noted that at issue are over 1,000 excess strategic missiles on the U.S. side and a like number on the Soviet side, all aimed at a worldwide market that may only be 100 or so launches over the next ten years. Obviously, the uncontrolled dumping of such a large number of assets on a relatively small market would have a significant adverse effect on the commercial ELV industry, especially if these assets are made available at no or low cost. In effect, the United States Government would be competing with the private sector again.

We are also concerned that, by reusing the older strategic missiles, the Nation would be relying on propulsion technology developed 20 to 30 years ago and would simultaneously stifle future investment in new, innovative propulsion and related technologies for at least the next decade.

In many respects, the situation is analogous to the events following World War I, when the United States Government decided to allow the release of Liberty aircraft engines for use by Government and other customers. In the 15 years following this decision, no major advances were made in aircraft engine technology within the United States. Now, as then, we lay on the verge of a near-sighted, self-inflicted wound that will set back new technology development and significantly diminish our international competitive position. We fear technology may be revisited—history may be revisited.

We are also concerned that the release of strategic ballistic assets would reverse eight years of policies aimed at stimulating the commercial space program and reinforce the perception that the Government is not a reliable, consistent partner with industry. With the leadership of this subcommittee and those in the executive branch, the United States Government has attached a very high priority to the advancement of the commercial space industry. OSC responded to this challenge and we developed the Pegasus air-launched booster totally with private financing, the first company to develop a new rocket with private capital in the last 25 years.

It should also be noted that President Bush's national space policy states that "the Government space sectors shall purchase commercially available space goods and services to the fullest extent possible and shall not conduct activities with potential commercial applications that preclude or deter commercial sector space activities except for national security."

Another portion of the document states that "Government sectors shall encourage to the maximum extent feasible the development and use of United States private sector space capabilities."

Finally, it states that "the United States Government will, as a matter of policy, pursue its commercial space objectives without the use of direct Federal subsidies." We strongly believe that the uncontrolled release of strategic missiles will violate these policies.

If a decision is made to retain and reuse strategic assets, and that decision is contained in a ratified START treaty, we believe certain conditions should be applied to the reuse of these assets.

First, a fair market value should be established for the strategic missiles in order to facilitate an equitable cost competition among companies competing in the civil, commercial and defense markets. The United States Government should not place itself in the position of subsidizing the reuse of these assets.

Second, a reasonable time period should be established for release of the assets to minimize the adverse impact on the industry.

Third, limiting the use of strategic assets to only suborbital applications we believe would diminish the impact on the ELV industry.

Finally, we believe that all contractors should have equal and open access to the technical data relative to these missiles in order to enable equitable bidding in any future contracts. We think fairness would best be facilitated if hardware exclusion clauses were applied to preclude the original manufacturers from competing on these contracts.

OSC believes that if these four conditions are applied to the release of strategic assets, it is possible to satisfy both the national objectives for reuse of missiles that have been procured at considerable cost to the United States Government, and also avoid irreparable damage to an industry that has responded to the challenge of its Government through the development of innovative technologies that have the potential of significantly advancing the national interests of our great Nation.

Mr. Chairman, I thank you and the members of the subcommittee for this opportunity to address you today. I join my colleagues, Mr. Chairman, in thanking you for your leadership and support to the United States space program and wish you well in your future endeavors.

[The prepared statement of Gilbert Rye follows:]

STATEMENT OF

GILBERT RYE
SENIOR VICE PRESIDENT, BUSINESS DEVELOPMENT
ORBITAL SCIENCES CORPORATION

BEFORE THE
SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

30 NOVEMBER 1990

Mr. Chairman and Members of the Subcommittee:

I am Gilbert Rye, Senior Vice President for Business Development of Orbital Sciences Corporation (OSC). OSC was founded in 1982 and has been one of the fastest growing high-technology companies in the United States during the past eight years. OSC is perhaps best known for two of our commercially-developed space launch systems: the Transfer Orbit Stage® orbit transfer vehicle and the Pegasus™ Air-Launched Space Booster, which we successfully launched on April 5 of this year with significant involvement from several U.S. Government agencies.

Mr. Chairman, I believe a strong U.S. commercial space industry is important for our national technological and economic health as well as our country's place in the world space community. Our Federal Government plays a vital role in fostering the commercial space industry, and reaps the benefits of low-cost, innovative products and services which emerge as a result. Government participation in OSC's Pegasus and TOS programs, among others, has been essential to our success. Together, OSC and the U.S. Government have "done things right", and our mutual success provides a model for Government-industry cooperation. Let me provide you with an update on OSC's programs.

INTRODUCTION TO ORBITAL SCIENCES CORPORATION

OSC is a commercial space company headquartered in Fairfax, Virginia. We provide low-cost access to space with a wide variety of advanced-technology space products. OSC develops and produces space transportation systems, which include space and suborbital launch vehicles and orbit transfer vehicles; space support systems, which include satellite tracking systems and atmospheric environmental monitoring products; and satellite systems and services, which include spacecraft platforms, space instruments and satellite-based data communications services. In the eight years since the company's founding in 1982, OSC has grown from three

individuals to a 700-person company with facilities in four states. The company had revenue of approximately \$80 million in 1989.

OSC's initial product was a new orbit transfer vehicle known as the Transfer Orbit Stage (TOS), which is designed to launch satellites from the Space Shuttle and the Titan unmanned rocket into higher orbits and planetary trajectories. We are currently producing two TOS vehicles under a contract with the National Aeronautics and Space Administration (NASA), to launch the Advanced Communications Technology Satellite and the Mars Observer spacecraft in 1992. NASA's strong support for this program, particularly at the Marshall Space Flight Center, provided a vital base for the rapid growth of OSC and the hiring of top-flight engineers who have conceived and developed our subsequent programs.

More recently, OSC developed a new low-cost space launch vehicle called Pegasus® which pioneers an innovative approach for launching small satellite payloads into orbit. Pegasus recently completed its first orbital launch after deployment from a NASA B-52 carrier aircraft. Pegasus is the first all-new, unmanned launch vehicle to be developed in the United States in 20 years. The successful Pegasus launch marked a number of additional "firsts" for the space industry. Among its technical milestones, Pegasus was the first air-launched vehicle to achieve orbit, the first launch vehicle to use a wing to aerodynamically assist in its flight, and the first winged vehicle to fly at speeds exceeding Mach 8, or eight times the speed of sound. More importantly, the Pegasus flight marks the first time a privately-developed space launch vehicle has carried a payload into orbit. Pegasus was developed in a privately-funded joint venture between OSC and Hercules Aerospace Company during a two and one-half year period beginning in 1987.

OSC's customer for the first Pegasus launch was the Defense Advanced Research Projects Agency (DARPA), in conjunction with their Advanced Space Technology Program. DARPA has contracted for a second Pegasus launch in 1990, while the U.S. Air Force has ordered three launches for later missions. In addition, OSC submitted a proposal for Pegasus in response to NASA's Small Expendable Launch Vehicle and the Air Force Small Launch Vehicle procurements. A variety of commercial and international customers have also expressed a strong interest in Pegasus. The Swedish Space Corporation purchased a launch reservation for its Freja scientific satellite, which previously was scheduled for launch on a Chinese Long March vehicle, and OSC has signed a preliminary agreement with the European consortium Arianespace to market Pegasus in Europe.

Pegasus is the product of outstanding teamwork between the U.S. Government and the private sector, and I believe serves as a model for Government-business cooperation in the advancement of new space technologies. OSC identified an emerging market for a low-cost launch vehicle to place small satellites into low-Earth orbit. OSC then initiated the design and development of the launch vehicle (without any prior agreements for purchases), committing substantial corporate resources into securing key partnerships within industry and Government. NASA, DARPA, and the U.S. Air Force all provided a tremendous amount of assistance and support to the Pegasus program. DARPA's role as the first customer for Pegasus launches was especially vital. Its early commitment as an anchor tenant at a critical stage in the Pegasus program allowed OSC to secure the capital needed to complete development of the vehicle.

Several NASA centers supplied technical assistance, use of facilities and key technologies to the Pegasus program. NASA's Dryden Flight Research Facility provided use of the NASA B-52 aircraft, which was essential to the timely and low-cost development of Pegasus. Although commercial aircraft were available, NASA's unmatched experience in aircraft operations from the X-15 program and the availability of the B-52 on a timely basis shortened the Pegasus development schedule and minimized OSC's up-front capital requirements. NASA's Ames Research Center provided extremely valuable expertise in computational fluid dynamics modeling which saved millions of dollars in wind tunnel testing. NASA's Goddard Space Flight Center developed the PEGSAT satellite which was the primary payload on board the first launch.

In addition to Pegasus and TOS, OSC develops, produces and launches suborbital boosters and sophisticated space payloads for scientific, educational and defense missions. So far this year we have conducted or participated in four major successful suborbital launches, with at least five more planned by the end of the year. OSC's High Performance Booster, an improved version of the Aries system, was launched for the Defense Nuclear Agency on January 30; our Minuteman I Consolidated Front End avionics and payload support package was launched by the U.S. Air Force on February 14; and we developed and integrated payloads for the launches of the Bow Shock Ultra-violet Experiment and the EXCEDE III payload for the Department of Defense in April. This spring, OSC's Space Data Division will conduct the first of three scheduled launches of our Prospector suborbital booster for the University of Alabama/Huntsville Consortium for Materials Development in Space, funded by NASA's Office of Commercial Programs.

With TOS, Pegasus and our suborbital vehicles, OSC has added a range of new vehicles to the U.S. commercial launch inventory. We are now working on a ground-launched vehicle called Taurus™, which will be capable of delivering over 3,000 pounds to low-Earth orbit. The first Taurus launch will take place in 1992, again with DARPA as the "anchor tenant" customer.

Our newest initiative at OSC is an innovative mobile communications system that will use 20 satellites in a low-Earth orbit constellation to provide world-wide, two-way data and position determination services. OSC formed a new subsidiary called Orbital Communications Corporation (ORBCOMM), which filed with the Federal Communications Commission on February 28 for permission to construct the system. ORBCOMM proposes to provide low-cost alphanumeric data communications and position determination for emergency assistance, data acquisition, tracking and messaging services using pocket portable mobile subscriber terminals. The ORBCOMM satellite constellation will provide virtually full-time coverage of the world's populated areas and oceans as well as frequent and regular coverage of the polar regions. Possible applications for the system include emergency medical, search and rescue, and roadside communications services; environmental, industrial and remote asset monitoring; property recovery (i.e. automobiles) and animal tracking; and real time two-way personal messaging services. By operating in low-Earth orbit and employing the UHF and VHF radio frequency bands, the cost of subscriber terminals is projected to range from \$50 for the simplest, to \$400 for the premium, putting these communications capabilities within reach of most Americans. In addition, because the satellites will be constantly circling the globe, service can be provided in foreign countries with only a small incremental investment in earth stations and computer equipment, potentially providing communications capabilities within the reach of millions of people abroad who previously could not afford any telecommunications capability whatsoever. The U.S. trade deficit also would be offset as these American services and subscriber equipment are exported.

ORBCOMM is economically possible as a result of Pegasus' availability to deliver satellites into a variety of inclined orbits at low-cost. We are excited about the international potential ORBCOMM holds, and are pleased that the U.S. Government has placed the issue on the agenda for the World Administrative Radio Conference to be held in 1992, so that we may obtain the necessary international approvals to permit full global use of the system. Dependent upon license approval, ORBCOMM plans to inaugurate domestic service in 1993. In summary, at OSC we are building upon our past successes to develop new products and services that will bring the benefits of space down to earth.

RANGE-SUPPORT TO THE COMMERCIAL INDUSTRY

Mr. Chairman, you asked that we comment today on the suitability of Government range operations for commercial launches. Many of OSC's programs would not have been possible without the Government's technical assistance and use of Government facilities, equipment and services. OSC plans launches from several of the nation's launch facilities, including the Eastern Test Range in Florida, the Western Test Range in California, Wallops Island, White Sands and Kwajalein Island.

OSC's experience with Government ranges has been good. In general they are enthusiastic about supporting commercial launches, and we've found that the interaction with the range can benefit our programs. For example, while the process of safety reviews and requirements imposed by the Vandenberg Range for the Pegasus launch was stressful, in the end we believe we had a safer, more reliable vehicle. Also, resources such as back-up flight termination systems were provided by Vandenberg Air Force Base which enabled us to avoid significant costs.

There are some inefficiencies in the Government ranges. The rotation of military personnel through range positions prevents the higher degree of specialization and efficiency that would be achieved with a permanent group of operators. In addition, commercial launches generally receive lower priority than Government launches which is a special problem during periods of peak launch activity.

We believe commercial spaceports offer significant potential. I am pleased to inform you that OSC is currently in negotiations to launch the first rocket to leave the Earth from Florida's new spaceport facility next year. We anticipate that OSC will conduct the first six launches for Spaceport Florida, each one a suborbital rocket providing 10 to 15 minutes of microgravity for university research projects. OSC will be on the ground floor of establishing range safety documents and assisting in every aspect of setting up the range for Florida's exciting endeavor.

OUTLOOK FOR THE COMMERCIAL SPACE INDUSTRY

The U.S. commercial space launch industry literally took off in 1990, providing an optimistic start for the decade to come. Thirty-five commercial U.S. launches are listed on the Department of Transportation manifest through 1995, with 12 of those launches scheduled in 1990. That compares with just three successful licensed launches in 1989. The number of launches on the manifest increases to 17 for 1991, and nearly half of those will be conducted by OSC, more than any other launch company.

Still, foreign competition provides a considerable threat to the health of the domestic industry. In the last five years, the U.S. launch industry has lost 50% of the market to overseas competitors, and we may now be in danger of losing further market share. Despite this sobering trend, I believe that the emerging U.S. commercial space industry can produce innovative technologies and services that will successfully compete in the international marketplace.

The Government has been a vital, necessary partner in most of OSC's programs. But it is not sufficient for individual agencies to cooperate on selected projects. Coordinated Government participation in space enterprise is crucial if the U.S. is to maintain leadership in the 1990's and beyond. The U.S. needs to embrace a cooperative attitude toward commercial space, encouraging private-sector initiative through Government incentives.

There is a new way of doing business in space that is now emerging in industry. In the launch vehicle industry, businesses now sell launch services to orbit instead of selling launch vehicles. New programs are being funded with privately-raised capital, increasing both the risk and potential rewards to companies. In such an environment, national space policy must provide long-term stability and consistency, with equitable provisions for recoupment when policy changes cause damage to the industry. Industry must be able to plan for the future knowing that policies will not change a few years after they are initiated.

One of the greatest strengths of the U.S. Government in serving as a catalyst for space enterprise is its purchasing power. The U.S. Government accounts for over 90% of the U.S. space market and about 40% of the world market for space products and services. It will remain the largest single customer of space products and services for years to come. Commercial customers often look to Government involvement as an implicit seal of approval for a new product, service or company. It is with the size and scope of this market in mind, and the substantial impact of government policies in the past, that I bring up my next point.

Mr Chairman, there is one area of increasing concern to OSC, and that involves the potential retention and reuse of excess strategic ballistic missiles as space launch vehicles. We understand that the current U.S. negotiating position on the START Treaty calls for the retention of strategic ballistic missiles that become excess to requirements rather than destroying them as is being done on the INF treaty. The argument commonly used for retention of these assets is that the U.S. Government will save significant sums of money by reusing the missiles for launching satellites into orbit. We are concerned because of the potential damage to companies

like ours if the disposition of these assets is not handled fairly and equitably.

It should be noted that at issue are over one thousand excess strategic missiles on the U.S. side and a like number on the Soviet side, all aimed at a world-wide market which may only be one-hundred or so launches over the next ten years. Obviously, the uncontrolled "dumping" of such a large number of assets on a relatively small market would have a significant adverse impact on the commercial ELV industry, especially if these assets are made available at no or low cost. In effect, the Government would be competing with the private sector. We are also concerned that, by reusing the older strategic missiles, the nation would be relying on propulsion technology developed twenty to thirty years ago and would simultaneously stifle future investment in new, innovative propulsion and related technologies for at least the next decade. In many respects, the situation is analogous to the events following World War I when the United States Government decided to allow the release of Liberty aircraft engines for use by Government and other customers. In the fifteen years following this decision, no major advances were made in aircraft engine technology within the United States. Now, as then, we may be on the verge of a near-sighted, self-inflicted wound that will set back new technology development and significantly diminish our international competitive position. We fear history may be revisited.

We are also concerned that the release of strategic ballistic assets could reverse eight years of policies aimed at stimulating the commercial space program and reinforce the perception that the Government is not a reliable, consistent partner with industry. With the leadership of this subcommittee and those in the executive branch, the U.S. Government has attached a very high priority to the advancement of the commercial space industry. OSC responded to this challenge and we developed the Pegasus air-launched booster totally with private financing - the first company to develop a new rocket with private capital in the last twenty-five years. It should also be noted that President Bush's national space policy states that "the Governmental space sectors shall purchase commercially available space goods and services to the fullest extent possible and shall not conduct activities with potential commercial applications that preclude or deter commercial sector space activities except for national security". Another portion of the document states that "Government sectors shall encourage to the maximum extent feasible the development and use of United States private sector space capabilities". Finally it states that "the United States Government will as a matter of policy pursue its commercial space objectives without the use of direct Federal subsidies. We strongly believe that the uncontrolled release of strategic missiles would violate

these policies.

If a decision is made to retain and reuse strategic assets and that decision is contained in a ratified START Treaty, we believe certain conditions should be applied to the reuse of these assets.

- First, a fair market value should be established for the strategic missiles in order to facilitate an equitable cost competition among companies competing in the civil, commercial and defense markets. The U.S. Government should not place itself in the position of subsidizing the reuse of these assets.

- Second, a reasonable time period should be established for release of the assets to minimize the adverse impact on the industry.

- Third, limiting the use of strategic assets to only suborbital applications would in our opinion diminish the impact on the ELV industry.

- Finally, we believe that all contractors should have equal and open access to the technical data relative to these missiles in order to enable equitable bidding in any future contracts. We think fairness would best be facilitated if hardware exclusion clauses were applied to preclude the original manufacturers from competing on these contracts.

OSC believes that if these four conditions are applied to the release of strategic assets, it is possible to satisfy both the national objectives for reuse of missiles that have been procured at considerable cost by the United States Government and also avoid irreparable damage to an industry that has responded to the challenge of its Government through the development of innovative technologies that have the potential of significantly advancing the national interests of our great Nation.

Mr. Chairman, I thank you and the members of the Subcommittee for this opportunity to address you today. I am confident that with the U.S. Government's support, American industry can guide our nation to a position of international leadership in commercial space.

Mr. NELSON. Thank you, Colonel Rye. I thank all of you.

Mr. Walker.

Mr. WALKER. Thank you, Mr. Chairman.

Once again, I'm going to begin, I guess, with a little bit of a lecture before I ask the questions, because what I hear from your testimony is a somewhat one dimensional approach to commercial space. I mean, it is that which is the most traditional, and that is you sell a vehicle to the person that has the ride on top the vehicle, and you try to do that within a competitive world price.

My question is going to be—and I want to preface the question, though—is how much thought have you given to being entrepreneurial in terms of your active role as commercial space vendors? And by that I mean, have you looked, for instance, at selling ads on the side of your vehicles when you put them into space as a way of attracting additional money?

I mean, McDonnell Douglas just showed us this nice film and so on. You know, I'm sure you're showing that widely, it's been on television and so on. I will tell you, there are people out there who probably would have paid a fortune to put their advertisement on the side of that vehicle so that every time you show those pictures, their ad is before the public. Pictures of that that are in this museum, or maybe in the national space museum in Washington and so on, that had somebody's ad on it, is worth a fortune to these people. To have those ads on launch towers would be worth a fortune. To have the people who are talking in testimony here, when you referred to your Delta rocket or your Atlas rocket, or your Pegasus, if you were referring to it as the "Bic Delta" or as the "Seven Up Pegasus" and so on, becomes worth a fortune in the commercial market.

I'm wondering how far we have gone in trying to reduce the cost by really being entrepreneurial and commercial in what we do. Because it's more than just the money involved in it. It is also the fact that such companies that put that kind of investment forward then become active participants in the space program. Who knows, maybe their advertising will reflect your vehicle in their advertising because they have paid some money to do that. And that expands the space program into areas that we don't even think about the space program being in at the present time and attracts even more attention along the way.

It may be that you would have to end up looking at things a little bit differently than you do. I mean, aerospace executives are not used to coming before congressional committees and referring to their vehicle as the "Bic Pegasus" or whatever. But, you know, you would have to do that. That would be a part of the whole thing.

Your teams that show up in these pictures in the launch facility might all have to wear red shirts that say "Coca-Cola" on them in order to have the sponsors. But the fact is that there are people that pay money for that. I say that only because I have a little bit of experience in that area—and there may be all kinds of other ideas, too. But I say that as somebody who has some experience in that area.

One of my hobbies is I drive race cars. There are people who are paying a fortune to put their advertising on the side of race cars.

There are people who pay money so that I wear a Nomex suit that has advertising all over it—and I ain't going ever to win a race. But they do it because the fact is that there are lots of advantages to them in that kind of presence in the commercial market and there's got to be here, too.

So I would just like your reaction. I mean, is anybody looking at commercial space as multidimensional rather than single dimensional in some of these things, in order to begin to reduce the launch cost, because you get people active in the whole process of financing that are not now active?

Mr. LLOYD. Let me just address a couple of points.

I will admit that the Russians, actually, sold some advertising on the side of—I think it was a Proton. They sold, I know, the Generali, which is a large Italian insurance company, bought an ad.

We have actually talked to some customers about that. Our view of that is if the customer who is buying that specific service wants to participate in that kind of a program, we would be pleased to do that. So we actually have talked about that. But I will—

Mr. WALKER. But wouldn't your customer, with a load on the top, prefer to have probably a lower cost for his load on the top, by the fact that—

Mr. LLOYD. Absolutely.

Mr. WALKER. —you were aggressively out promoting advertising that may not involve his specific satellite?

Mr. LLOYD. Absolutely. That's the kind of thing we've talked about. We have actually talked about that.

The other thing that we have—

Mr. WALKER. Let me ask you this. What are the problems? I mean, why hasn't it been done?

Mr. LLOYD. The image—Certain customers would prefer not to do it, just from an image standpoint.

Mr. WALKER. Well—But, you know, I guess the question is, if you tell them it's going to cost you \$38 million to launch this if you don't have advertising on the side, and because of the advertising it's only going to cost you \$34 million, it seems to me that image might go down the—might be a little less important to them at that point, depending upon the rate at which you can sell the advertising.

Mr. LLOYD. That's right. That's very true, very true.

But as I said, we actually have active discussions along those lines. I don't know how they're going to turn out.

Mr. WALKER. Okay.

Mr. LLOYD. I don't know how they're going to turn out.

Mr. NELSON. What about an ad that says "Bob Walker for Congress"?

Mr. WALKER. Well—

Mr. LLOYD. That's right.

[Laughter.]

Mr. WALKER. My guess is that my campaign can't afford that ad, at least what I'm talking about. But there may be some campaigns in the country that can afford that. I think of a couple that were run this last year that may be able to afford \$4 million worth of advertising.

Mr. LLOYD. That's right.

One of the things we are doing is we have taken—we are actively involved in investing in certain commercial satellite ventures, communications ventures, and we have done that not to actually perhaps be so much in the commercial communications business but to facilitate our own business, which is the launching of the satellite. So what we have done is to look broader than just the launch business, but we've actually looked at some other businesses being players and investors in some businesses that would generate volume for our own business. So I think we have broadened our scope relative to the launch business.

Mr. WALKER. Are you talking about having someone, for instance, sponsor—become a sponsor aboard a satellite, so that every time that that satellite is mentioned as the way in which a news broadcast arrived, it is referred to as the "Shearson Lehman Communications Satellite"?

Mr. LLOYD. We actually haven't done that, although certain—

Mr. WALKER. Once again, there would be tremendous advantages to people if, in fact, you got that message out. Instead of somebody sitting on the Today Show saying that we are able to—you know, we have talked to you from London via somebody's, and it's your name of the satellite that you created for it, if it became a commercial name, that's a ton of advertising that someone is probably willing to pay a lot of money for along the way, and you bring down the cost of operation.

I guess, you know, if you're operating in a business climate, if you're in a commercial climate, I'm wondering why some of that hasn't been thought through.

Mr. LLOYD. As it relates to the satellites, of course, many of the satellites are commercial ventures in and of themselves. The Hughes Galaxy system, the AT&T people have their own satellites. I think those are commercial ventures. But those are some interesting ideas and they have not been expressed. As it relates to the advertising on the rockets, I think you will see some of that in the future.

Mr. WALKER. Anybody else?

Mr. MIHARA. On the Delta program, our current policy is the principal owner of that mission has the rights to advertise for his purposes, what he wants. Typically, that would include, for the Air Force, a very large, eight-foot sign saying that was an Air Force NAVSTAR mission. Similarly for NASA and commercial, they have their advertising as such.

In other ways, we have also done advertising in the sense of motivational advertising—

Mr. WALKER. If I could just cut you off there—

Mr. MIHARA. Yes.

Mr. WALKER. —is that because that is tradition, that that's the case? I mean, have those people asked for that? Has the Air Force demanded that, or would Air Force be just as happy to ride aboard something that was advertising Benetton clothing?

Mr. MIHARA. Well, I think it's both tradition as well as a lot of personal pride in having that mission for that particular customer, and they use it for their advertising purposes as well. So it's a combination of both tradition and a desire to make sure that that is a principal advertising they want for that particular mission.

Mr. WALKER. I'm guessing that if the price were brought down low enough, and if you became more competitive because of it, that that has to be looked at as being something that is important, given the need to be competitive in a world environment. That's the only thing I'm suggesting.

Certainly, you know, advertising on a launch tower or something like that does not get in the way of the program and yet can be very valuable.

Mr. MIHARA. It's a very interesting suggestion and I'll certainly take it up when I get back to the office.

Mr. WALKER. Mr. Rye?

Mr. RYE. Mr. Chairman, I have to confess we haven't thought about that. But we do have a lot of Pegasus launches ahead of us, we hope, and perhaps we can find some way of capitalizing on your idea, which I think is a very creative and innovative one.

We have, of course, been talking to a lot of potential investors and customers about potential uses of Pegasus and the satellites that will fly on it, and trying to group various users together on various total service kinds of approaches to business. But as far as an advertising approach, we have not—

Mr. WALKER. All I'm saying is—I'm not positive that that's the best idea. All I'm saying is that in a field where there is so much interest, there are multidimensional commercial applications available, that we need to think outside—since Dick Darman isn't in the room, I will use the word paradigm. I mean, we have to create some new paradigms in terms of commercial policy. You know, that's just one aspect of it that it seems to me is there. Some of you people who are far more innovative as business people than I am, it seems to me, could think up a lot of ways to take all the intention that is focused on things like space and use it to the advantage of both your program and also use it to reduce costs for the program.

I would simply urge that we begin to think beyond what we have traditionally done, which has been one dimensional. That comes out of the fact that a lot of these things were very experimental and they did not involve a lot of commercial applications. Now we've got to look beyond that and find ways to really use the whole aspect of commercialization to reduce costs and to expand, in my view, the whole perception of the program.

Thank you, Mr. Chairman.

Mr. NELSON. I have been told that foreign competitors are exploiting the fact that there is—that they exploit a perception that commercial launchers get the lowest priority here at the Eastern Test Range.

Now, we've heard the testimony here today. Do you find that that is a general perception in the international community? Each of you.

Mr. MIHARA. Well, I can refer to the Delta situation. One of my associates, Don McLean here, was resident here, a senior manager at the range, and can perhaps add a few more words.

But to my knowledge, we have not experienced a situation where, directly, a priority assessment has been made. The system, as Colonel Wormington described earlier, is, in fact, the system that is applied, which is one gets a reservation on the calendar and

on the agenda for the manifest with the range, and the range does their utmost to maintain that. So there may be, like he mentioned earlier, instances where we are asked, out of courtesy to each other's mission interest, to try to make adjustments. But to my knowledge, there has not been a deliberate campaign to try to specifically relegate the commercial missions at a lower priority at all.

Mr. NELSON. Now, my question is different. You're talking about substance. On the basis of the testimony we just received, which you have corroborated, that's the substance.

Now, my question is about the perception. What is the perception in your experience?

Mr. LLOYD. The perception is clearly that our competitors are selling that as a weakness from our standpoint. In fact, we are dealing with a couple of Japanese programs, and the word came back to us that that's perceived as one of our competitive weaknesses. We know that the competitors are selling that. We also don't agree that that's particularly true, but we do need to correct that perception because it's still being sold. It's actively being sold today.

Mr. NELSON. Is Colonel Wormington here? Is he back there? I can't see.

Colonel WORMINGTON. Yes, sir.

Mr. NELSON. Well, you've got—you know, we commend you for what you're doing, and you see now what has been stated here, that foreign competitors are doing. Other than you continuing to do the good job that you do, do you have any thoughts about how we might shatter this perception that competitors are fostering?

Colonel WORMINGTON. Perceptions are very hard to attack, particularly when the facts don't—

Mr. NELSON. Why don't you come up so the mike will record it.

Colonel WORMINGTON. Perceptions are very hard to attack, particularly when the facts don't bear them out. The best I think we can do is just continue to report the facts, and the facts are that people are granted access to the range not on the basis of any priority but on the basis fundamentally of first come/first served, and they are handled that way. If they stay on schedule, they go when they are scheduled to go. If they start delaying, then we fit them in at the next available slot. So we attempt to run this thing in a very businesslike way. If you do what you promise, we'll do what we promise.

Mr. NELSON. That's very good, and I wanted to get that on the record. Let's deal with the perception.

All right. Now, you all have heard the testimony earlier in this first session. Do you think enough is being done on the technical deficiencies at ESMC and Cape Canaveral to start to improve your competitiveness? And as part of that question, what would you like to see further be done to improve your competitiveness?

Who wants to start?

Mr. LLOYD. The first part of the question, is enough being done. Well, no, enough is not being done. I think, if I answered it in any other way, it would look foolish. We think clearly that some funding needs to be made available. The agency should identify it and Congress should appropriate it.

You know, this is one of the few places you can go and you can still have rotary dial telephones. It's amazing. It's not exciting to allocate money for new communication systems, but that's what needs to be done. So no, we don't think enough is being done. Certainly the money that's being allocated for the new operations center is good, but we also think that perhaps, perhaps there may be a role for the Department of Transportation to provide some funding for such things as additional head count for second shifts. We think the Florida Spaceport can provide some funding.

So clearly, no, enough is not being done. But that is not to say that we don't think the Air Force is not doing a good job with what they have. Those are two entirely different issues. I have read a number of statements from Colonel Wormington that I think he would tend to agree that enough is not being done. I think that's what he said this morning as well.

Mr. MIHARA. I might add a comment relative to the Delta experience. We're still using the same basic facilities as we used in 1960. The same basic system of using gantries to stack up the launch vehicle on the pad remains today. Clearly, when we look at the competition, in the case of Ariane, for example, where the European governments sponsored their system and they are able to have preparation times on the pad down to the order of a few days, and in the case of the Soviets, with the Zenit system, they have already demonstrated with their financial support developing that system where the time on pad is down to less than 24 hours.

We have ideas on doing similar things. We can build up a Delta and move it to the pad in launch within a matter of a few days. Right now, it takes us about 35 days. That takes investment, combined with the innovations that we do have, and it can be done. So that's an example of the type of improvements we'd like to see.

Mr. RYE. Obviously, we can't speak with as much experience as General Dynamics and McDonnell Douglas. We would like to obviously see the facilities modernized. We do have big plans for the use of ranges and we would obviously like to see those modernized and upgraded to the extent possible.

Mr. NELSON. Mr. Mihara, could you tell me something about the Zenit, how they can do it in less than 24 hours?

Mr. MIHARA. Well, the basic architecture of the rocket, they started in somewhat an interesting fashion. They have applied the principles of the advanced launch system concept, but they did it starting back several years ago. Basically, that principle being that you design the rocket in the first place so you can build up the rocket, integrate it, check it out, assemble it, before you go to the pad. And they do this all horizontally. So you don't have to have tall buildings and transfer in a vertical position.

They have their umbilicals all through the base of the rocket so that you can rotate the rocket after it has arrived at the launch pad and not worry about connecting umbilicals. They fill the fuel through the base.

These are the ideas that they have put to practice, again with government support, and these are some of the principles that I think we can apply in this country and become, therefore, more cost effective and competitive.

Mr. NELSON. All right. Now, we're talking about an ALS system with a future, at minimum, is at the turn of the century, ten years away. That's got to be a policy decision that has to be made, that we're going to develop this. Under the present procedures, an ALS system is not going to be ready for ten years.

What do you think we ought to do? Each of you is representing your own companies, who have your own interest to sell your own vehicles. We've got to pull you out of your own interest now and look at the national interest. What do you think ought to be done?

Mr. LLOYD. Let me—I know other people have used this analogy, but I think it's an outstanding analogy. There are a lot of people that criticized President Eisenhower when he proposed an interstate road system because there wasn't a requirement. It's the same thing we're hearing, and we heard it this morning. We aren't going to do a heavy lift vehicle because there's not a requirement.

You know, I would dare say there's not more than one—there is no single thing that has fueled the economy of this country more in the past 50 years than the interstate highway system. So, Mr. Walker, to your comments, I really don't know what you can do in space if you had \$200 pounds to orbit or \$300 or \$400 or a thousand dollars or whatever it is. I'm not sure. We really can't build those requirements. But something so fundamental to the commercialization of space, whether it's your "Low Orbit Holiday Inns" or whatever it is, but you're not going to get there without it. So I really bristle when people say I don't see the requirement. That just doesn't make sense to me.

However, we have looked at commercializing a heavy vehicle, and under certain circumstances it might make sense. The real problem is that clearly many of the requirements would be Government requirements. Under the current funding restrictions, the anti-deficiency and all those sort of things, the stability of the policy and the stability of the business, of the market, if you will, would lead us not to make that decision at this point in time. If the Government said we'll commit to 20 launches in an x period of time, then I think you could go out with your—you know, Mr. Walker, you could go out with your approach. But the problem is, most of the commercial requirements we see, at least through the year 2000, 2005, can generally be met with the current vehicles, although I think there will be some commercial applications a bit further out. So I guess those are the comments that we would have.

Mr. WALKER. If you will yield, Mr. Chairman, has anybody talked to you, though, in those terms, you know, come to you and said, you know, if you could develop a commercial heavy lift launch vehicle, how many flights would it take in order for you to do that? I mean, has anybody been willing to come and talk to you—

Mr. LLOYD. Not to my knowledge, not to my knowledge.

Mr. NELSON. Mr. Mihara?

Mr. MIHARA. One thought comes to my mind, and that is—and I think some of the testimony today confirms it—several of the agencies do have individual agency requirements for advanced launchers, and most of the requirements have been somewhat compartmented to the interests of that particular agency. These are good reasons. There are good reasons for this. The Air Force has its interests; NASA has its; and commercial, although it's still searching

for a good sponsor in the Government, has its requirements. In many respects, these are different.

Perhaps what is really needed is a consolidated, integrated, national activity toward achieving the goals that we have, where requirements are at a national level, and it takes into account all of the requirements of all the agencies and commercial, and then get on with the program needed to satisfy that national need. Perhaps that's the right solution to finding the right answer for everybody.

Mr. RYE. Of course, Mr. Chairman, OSC is not in the heavy lift business. But I would just note from a national perspective that in this area, as in many others in our U.S. space program, we can pre-ordain a second-class nation for ourselves if we don't make some fundamental investments in the infrastructure that's necessary to maintain leadership. Most fundamental to that is in the area of space transportation. It's probably the one area that cuts across all of the areas of our space program and enables us to continue to be a leader in the world. If we aren't willing to make the investments necessary to maintain that, we will, indeed, become a second-class country, not only in the space program but perhaps in other areas as well.

Mr. NELSON. And that's what I'm worried about. If we don't get this message across, then the Zenits of the world and the H-IIs of the world will take it away from us. This country's strength is on its ability, through research and development, to produce the new technologies if we're going to compete in the international marketplace. And I'm not talking about just competing in commercial space launches. I'm talking about every competition.

All right. Let me ask you a different question and then we'll bring this in for landing so we can conclude with your panel.

In this report that was written to the Secretary of DOT, the question is raised about going out and building a new commercial spaceport. And the example is given of a \$500 million spaceport for medium ELVs, and say it were to be constructed with \$250 million from the Department of Transportation, \$250 million from State revenue bonds, and if the debt service on that \$500 million of bonds was at 10 percent—no, just on the \$250 million of State revenue bonds, because the part from the Federal Government assuming in this case is a direct appropriation or grant—you're still looking at—10 percent debt service per year on \$250 million of bonds is \$25 million a year. And if you're only having ten commercial launches a year, you're looking at an interest cost to the commercial user of \$2.5 million per launch, as compared to approximately the \$3 million that is now used per launch for the national range, and the \$2.5 million is only an interest cost for actuarial retirement of debt of construction of a new spaceport. So the report concludes, "It is believed that the cost—" well, the bottom line is it's questioning whether or not you can afford to go out and build a \$500 million new spaceport, commercial spaceport.

I would like to have some of your comments for the record on this.

Mr. LLOYD. I'll start.

As I mentioned earlier, you know, we've placed our chips down here in Florida. We put \$100 million into—which are now Government-owned facilities, by the way. And we have to recover that

\$100 million through sales, through our sales of commercial launches. So from a purely parochial standpoint of General Dynamics, you know, we put our bet down here and, in the foreseeable future, we think that applies just because the way you do the math. The volume just doesn't pay out for medium and large.

Do the math for a small facility, however, might make a difference, because the infrastructure investment may be lower and the volumes that the folks like OSC are looking at may make that pay. But you just—You know, I participated in the analysis that went into this, and you just can't make the thing work based upon the volumes that we foresee today, and the amount of investments that have already been made in this facility here.

Mr. NELSON. You say your company has invested \$100 million?

Mr. LLOYD. Just in the facilities here, about \$100 million in just the facilities here down in Florida, redoing the two pads over there. You know, essentially, we almost could have just torn the things down and built them up again. In fact, in the case of one of them, it's just about what we did. So we even invested in the facilities down here, so we don't think that, for the medium size, medium and heavy, it could play out. A small thing might look possible, at least in the near term.

Mr. NELSON. Mr. Mihara?

Mr. MIHARA. Well, it's an interesting question. The assumptions are also quite interesting. The assumptions include that there may be a mission model of about ten per year. In the Delta class, perhaps a more realistic number might be of the order of perhaps six or seven per year over the longer term. But if you reduce that by the Air Force mission, as an example, because the Air Force is quite satisfied with our ability to meet their operational needs for now with a launch rate capability which exceeds their requirement, that would leave the commercial and a few NASA missions. And if you take the NASA ones away, we might be talking of one or two commercial. And then to have to allocate not \$2.5 million but maybe much bigger than \$2.5 million for each of the commercials, it really becomes a very difficult situation as far as a practical financial solution.

My preference is, in this kind of a market situation, to make it more feasible, the maximizing the Government sponsorship, like the rest of the countries do in this world, which is a national resource, a national facility, and an appropriate means of having that capability is, frankly, grant money. So that one can have that capability and not require charging for the relatively few users there are.

Mr. WALKER. Mr. Chairman, if I might, I'm a little bit concerned about the figures we're working off of here. I wonder who, when they developed this report—and it's not the fault of anybody here—but to suggest that the debt service on State revenue bonds, which I assume are tax-free bonds, would be at a 10 percent rate? Unless you've got a State that's in pretty bad financial shape and has an absolutely terrible credit rating, that's an absolutely crazy rate for a tax-free bond.

You know, it substantially changes the figure. If, in fact, those bonds are being sold at three and four percent rather than ten percent, and you're talking about a million dollars rather than two-

and-a-half million of money for the service of a spaceport, you're talking about a whole different ball game. I'm wondering who designed this. You know, it almost sounds like it was designed by somebody who was not particularly enthusiastic about the idea of commercial spaceports when you talk about that level of debt service at ten percent. I mean, you could go out and sell commercial bonds that would be nontax free in the ten percent range. It just strikes me that that's a rather "iffy" figure to be basing very much in the way of testimony on.

Mr. NELSON. One of the—I don't know that this is the case, and perhaps you all can give us some background as to why this figure was put in there. But I believe that there is a limited availability of tax-free capability for new authorities under some of the tax bills that we've passed. We can get that in the next panel—

Mr. WALKER. That could be, and that may be something we would want to—You know, if we know that to be the case, and that's something I want to put in the commercial space bill that I'm going to introduce, to expand that opportunity. Because, I mean, that would make a big difference.

Mr. NELSON. We need you to go in front of the Ways and Means Committee and propose that in the next tax bill.

Mr. LLOYD. One of the things you might ask, you might ask the Florida Spaceport people what they expect their bonds are going to go at. I would guess it'll be closer to ten than three. That's just a guess.

Mr. NELSON. All right. Let's ask from the small ELV standpoint. Colonel Rye?

Mr. RYE. Well, as I indicated earlier, Mr. Chairman, we are planning on participating with the Florida Spaceport and we're very enthused about that, in some of our smaller suborbital launches that are being made by our Space Data Division in Arizona. For our larger—larger is a relative term for us—larger than suborbital is our Pegasus and our upcoming Taurus launch vehicle. Of course, Pegasus is an air-launched rocket, and the principal advantage of that is it reduces the dependency on static launch sites. In the case of Taurus, we're still looking at various alternative launch scenarios for Taurus so we haven't concluded yet which one of those makes sense from a commercial enterprise standpoint.

But certainly we continue to look at the concept of State-sponsored spaceports as being one that's an innovative idea and one that deserves a lot of attention and a lot of support.

Mr. NELSON. Gentlemen, we thank you very much. It's been most stimulating.

We would like to call upon the next panel, the State spaceports, Mr. O'Connor and Mr. Spreyer. Edward A. O'Connor, Jr. is Executive Director of the Florida Spaceport Authority; Frederick Spreyer is the Washington Representative of the Hawaii Space Development Authority. We're looking forward to you sharing with us.

May we also, in the interest of time, ask you to just talk to us in a summary of your thoughts, and then we would like to get into some questions with you. We certainly laid the predicate here for you and have been discussing what you were going to tell us all day, as a matter of fact.

Mr. O'Connor.

STATEMENTS OF EDWARD A. O'CONNOR, JR., EXECUTIVE DIRECTOR, SPACEPORT FLORIDA AUTHORITY; AND FREDERICK C. SPREYER, WASHINGTON REPRESENTATIVE, STATE OF HAWAII DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT AND TOURISM, AND THE HAWAII SPACE DEVELOPMENT AUTHORITY

Mr. O'CONNOR. Thank you, Mr. Chairman, and members of the subcommittee, for giving us this opportunity to speak to you today.

You have set a challenging environment here for us to respond to with many of the questions you've asked earlier, pointing out, I think, some of the very fundamental issues that spaceports sponsored by State governments are trying to set up.

Subsequent to the Challenger accident, the administration redefined our commercial space policy and made some very profound changes in direction for our space program. The State of Florida watched the evolving concepts in the international marketplace and, to be very candid about it, were quite concerned with where our space program was going. The technology leadership of NASA and the Air Force in space systems has been outstanding. Looking at the Federal budget process, we were detecting diminishing capability to support the fine initiatives and technologies that our Government has in the past provided.

From a Florida perspective, we were very concerned with the economic impact that a diminishing space program would have within our State boundaries, and we were also concerned for the Nation as a whole, because we think space is not a single-State issue. It's a multi-State environment, where manufacturing facilities are in Southern California, they are in Colorado, and even the launch sites here. Without us working together, we cannot mutually succeed with our economic base.

With those concerns in mind, our State legislature and Governor deemed that it would be appropriate to put a spaceport authority structure together. The authority was structured in a way to permit us to be partially outside of the normal governmental State requirements to give us the flexibility to respond to industry needs and industry challenges.

They have authorized us to issue municipal bonds to support innovative financing techniques, so we can form true partnerships in financing with industry and with the Federal Government programs of mutual benefit, to programs that will strengthen and improve our international competitive position.

We also looked at our facilities at Cape Canaveral Air Force Station and were greatly concerned with the age of the facilities, both at Cape Canaveral Air Force Station and also at Kennedy Space Center, where initial investments were made in the '60s, and since that time new investments have been very limited. There has a great emphasis on the part of NASA on their flight hardware, limited emphasis because of budgetary concerns on redoing the infrastructure of ground support systems.

In the case of the Air Force, prior to Challenger, all of those systems were marked for retirement. There was no real need to make those investments in the minds of many because the shuttle was

going to be the prime workhorse for space exploration and utilization.

As was said earlier today by many people—Colonel Wormington, the ESMC Commander, and others—the facilities we have to utilize here in Florida are basically facilities that were developed for our ICBM programs, that were developed again back in the '50s and '60s. The investment in the facilities was of that same period.

That gives us two problems. One, labor-intensive, hard to maintain systems, that in many cases are located too close to launch pads for modern vehicles, inopportunedly sited for many other purposes, and don't encompass the best of modern technology. We also looked at the launch vehicles and many of the issues that you touched today, about our international competitive position. I think a lot of those concerns are derivative of the older systems that we're trying to evolve into new modern systems.

Many of the foreign competitors stress that we are not a reliable, efficient launch society here because the systems are old and they spend a lot of time on the launch pad, and that we, in turn, have to look at modernizing and improving our position to support that.

Some of the things that we very specifically are looking at at the State level are some programs where we would nurture all parts of the commercial space activity. One of the most important areas in our mind is the educational process. We have to start building the new generation of scientists and engineers and mathematicians that can keep us going forward in space.

To do this, we in the State of Florida have asked for the Air Force to relinquish for use part of Eglin Air Force Base where we will reactivate a small launch site. At that launch site we hope to launch sounding rockets beginning this coming April. These will be launching small, university payloads to nurture and improve the capability of Florida State universities as well as other universities to get small programs into space very, very quickly. It is our intent to have no more than a 90 to 120 day period of time from a request for a launch to an ability to launch a small university payload.

We have also worked with the Hawaiian Spaceport to assist them in developing a similar capability at Hawaii because we think universities working together across the country can be a strong base of support for furthering the entire space industry.

We have also made reservations for six lockers on spacelab missions that will commence on the shuttle shortly. Some of those programs are going to involve multi-State university programs. Our very first launch with space lab will be for a laser experimental program that will be sponsored by the University of Central Florida, the Florida Institute of Technology, the University of Southern California, as well as the University of Hawaii, where we will work together in a cooperative atmosphere to support these programs and the developing technologies.

The State legislature also has approved \$500 million in revenue bonds. We feel that these can be a vital revenue source and financing mechanism. Because as we all look at our aerospace industry at this point in time, with the downsizing of the Department of Defense budget, and the budget cuts, I think we're all looking at diminishing capabilities of these companies to go to the typical normal marketplace to finance some of these programs which are

vital not only to their ongoing activities but I think to our Nation's space program.

We are looking to use these bonds not as a taxpayer-backed, sponsored bond issue, but as a mechanism for companies to obtain capital in conjunction with the State government to finance their needs. The bonds will require the full backing and support of the companies that are going to issue with us those bonds, and be supportive of the facilities that are built with the bonds.

We have also gone forward, as you mentioned earlier, to the Department of Transportation, asking for assistance on some technology issues which we think are basic to our space transportation architecture. Part of this is the modernization and the sharing of new capabilities among multitudes of users. We have been working with the Air Force to identify areas where we can work to help multiply their capability to support the commercial launch environment. This also, in turn, will support hopefully their systems.

We are not looking with a single focus just to commercial space. We think it's important that the whole space program be revitalized, be focused in a manner that optimizes a partnership between the Federal Government, State governments, and industry to jointly fund and sponsor programs and encourage the excitement that a lot of times that you can only get from the commercial side of the innovative thought process, the quick reaction, the ability not to depend on a five-year military construction program to project out your capability of when you can build a new facility, but something that will permit you in a bond environment, within 120 days, to go to the marketplace, have the funding for something that is well thought out, finance it, and go about and get in business and start working.

When we look overseas at the international marketplace, we see that kind of resilient marketing force being applied. We see down at Kourou heavy investment on the part of the ESA nations in building new infrastructure that will sort their forthcoming commercial activities. We see the same kind of activity going on in Japan, where they are collecting companies together in the form of Keiretsu, given the appropriate financing through government-sponsored groups and banking, to make sure their programs move forward.

We desire to do the same type of function here without direct subsidization but with a true, strong support for commercial industries and their involvement in expanding interests in their space infrastructure.

The goal of the Authority is to provide a facilitating mechanism. It is not our goal to be another NASA or be another Air Force launch agency. We are looking at a role that I think can be vital and can be innovative and be made a stimulus to new ways of financing, new ways of thinking through the process to keeping the United States paramount in space.

We, as a State, do not want to see our space industry go the way of many of our other high-tech industries, where now we can only go to look for color TVs that are manufactured overseas, a technology that was developed here which we now don't get to profit from. We're going to make sure, to the best of our ability, that we work here within the United States for a strong space program.

We have worked now with 15 additional States to form an organization of States that can work together to provide political support at all levels to the process of revitalizing and maintaining a strong, dynamic space program.

That is a very quick outline. We have more extensively provided discussions in our written testimony. We think that what we're trying to do can be a very strong partner for the rest of our Federal space program and commercial space program, and we hope, with the effort of Congress and the support of Congress, we can fulfill that niche role and be of great assistance.

[The prepared statement of Edward O'Connor follows:]

T E S T I M O N Y

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS

BY

EDWARD A. O'CONNOR, JR.
EXECUTIVE DIRECTOR
SPACEPORT FLORIDA AUTHORITY



NOVEMBER 30, 1990, KENNEDY SPACE CENTER, FLORIDA

INTRODUCTION

"It is the intent of the (Florida) Legislature to provide a unified direction for space-related economic growth and educational development, to ensure a stable and dynamic economic climate, to attract and maintain space-related businesses suitable to the state, and to further the coordination and development of Florida's economy." (From the Spaceport Florida Authority Act, Chapter 331, Florida Statutes.)

Rapid and continuing developments in international space programs have prompted the State of Florida to take a proactive approach to space-related economic and educational development.

The Spaceport Florida Authority was created by Florida's Governor and Legislature in 1989 to maintain and improve Florida's competitive position in space enterprise, including industry, education, and research. Much like an airport or seaport authority, our primary responsibility is assisting the space transportation industry, as a partner, to develop and improve necessary infrastructure.

As a public corporation, body politic, and subdivision of the State of Florida, the Authority's overall goal is to maintain the state's (and, in turn, the nation's) position as a world leader in space enterprise by facilitating industry/university/government partnerships, and providing the one prerequisite to the industry's success: routine, assured, and cost-effective access to space.

By creating the nation's first space transportation authority, the State of Florida has clearly established its desire to ensure the viability of domestic space-related industry. Spaceport Florida's mission is in many ways similar to that of a standard airport or seaport authority: to provide infrastructure and support services required to maintain a vigorous and competitive transportation industry. Our efforts to develop and improve launch infrastructure and operations at Cape Canaveral and Cape San Blas have gained international recognition and can have a significant positive effect on Florida's future in the U.S. space program.

The U.S. space program is in the process of restructuring in response to foreign competition, to accommodate new technology needs, and to adjust to federal budget limitations. This restructuring process has presented the State of Florida with unique opportunities to develop inventive programs aimed at assisting the national space effort, and to develop mutually beneficial partnerships to share the task of maintaining U.S. leadership in space enterprise. These partnerships will result in a continuing investment in the state, and help ensure that existing space industry assets within Florida continue to contribute to our state and national economy.

The Authority's efforts will counter some of the effects of defense-related slowdowns and NASA budget constraints on the high technology sector of Florida's economy. According to the U.S. Department of Commerce, commercial sector space-related revenues are expected to increase by over \$880 million to \$1.6 billion in 1990, up from \$2.8 billion in 1989. By providing various incentives to industry (including bonding capability and sales-and-use tax exemptions), and by marshalling the resources of our university system, the State of Florida will become a national leader in space industry--a technology intensive, high value-added industry which will grow and mature well into the next century.

OPERATIONAL STATUS

According to Chapter 331, Florida Statutes, the Spaceport Authority must "develop a strategy for and implement the acceleration of space-related economic growth and educational development within the state." Specifically, the Authority is committed to establishing a more competitive environment where space businesses have:

- * Easy and economical access to launch and launch-support facilities.
- * Enhanced capabilities for infrastructure and systems modernization.
- * Access to facilities for payload development and preparation.
- * Access to financial assistance and alternatives for infrastructure development.
- * A mechanism for forming partnership arrangements with government and universities.
- * An experienced pool of engineers, scientists, and other support personnel.
- * Easy access to universities and research centers.
- * Access to business incubators for small and entrepreneurial space-related firms.
- * Strong support from federal, state and local governments.
- * Assistance and support for safety and environmental issues.
- * An advocacy organization dedicated to providing support and assistance to space industry.

As a new organization with unique responsibilities and goals, the Authority has endeavored to maintain its ambitious operational schedule while addressing the significant administrative responsibilities associated with being a startup organization within the state government.

The Authority's Business Plan, which was submitted to the Governor and Legislature in April, stressed our commitment to both directing and responding to the space industry's needs. Based on that commitment, our objectives have evolved in parallel with the various commercial space markets.

Our initiatives to provide improved support to Florida's space-related industry are providing an example for other states interested in developing or maintaining space-related industry. Further, having worked closely with the various federal agencies concerned with space industry, our efforts are entirely consistent with federal space-related policies and legislation, including the National Space Policy, the National Transportation Policy, and the Commercial Space Launch Act.

CAPE CANAVERAL LAUNCH SUPPORT FACILITIES

Pending the internationally expected development of a market for small-class orbital launch vehicles (which will service the growing market for smaller, lightweight satellites), the Authority plans to request the use of deactivated military launch facilities at Cape Canaveral for Spaceport Florida launch support to this class of vehicle.

The development of a small-class commercial launch pad--capable of accommodating a variety of such vehicles--will either be sponsored or facilitated by the Authority. Several small-class launch vehicles are currently under development by commercial companies, but the major markets for these rockets are thus far still driven by NASA and military programs. Although commercialization of these systems is interded, NASA and the Air Force have delayed their scheduled procurement of three small-class launch systems (SELV, SSLV, and COMET). The Authority has offered its services to support these programs following contract awards.

The Authority's assessment of the near-term commercial launch market has altered our initial objective from immediate construction of a dedicated small-class launch pad, to the development of an enhanced multi-user launch control capability for all commercial launch facilities at Cape Canaveral. This strategy will satisfy a vital need for both existing and future launch programs, including the Authority's own launch facilities.

Other new launch-related facilities are planned by the Authority to support the Atlas expendable launch vehicle program. Using the nation's first municipal space bonds, the Authority, in cooperation with General Dynamics Space Systems Division, is proposing to develop several facilities required to satisfy Atlas commercial and government launch requirements over the next several years. Among the facilities planned are: 1) a Jettisonable Component Assembly Building, 2) Solid Rocket Motor Processing and Storage Facilities, 3) a Site Support Building, and 4) two Warehouse Buildings.

Although Cape Canaveral is perceived by many to exemplify the state-of-the-art in U.S. technology, today's commercial launch operators are increasingly concerned about their ability to meet launch commitments due to near-obsolete support infrastructure and equipment. With a current total of 36 commercial launches scheduled through 1995, the Authority's priorities at Cape Canaveral are aimed at improving and replacing the vital common infrastructure associated with existing launch operations.

INFRASTRUCTURE AND SYSTEMS MODERNIZATION PROGRAM

Given increasing levels of foreign competition in the launch industry, and current plans for the development of new spaceports around the world, Florida's support to existing launch programs must be strengthened. Toward maintaining this vital component of Florida's economy, the Authority is working with launch-related companies, universities, and government agencies to establish a system for generic commercial launch infrastructure modernization at Cape Canaveral.

Several studies conducted by and for the federal government (through the Air Force, Department of Transportation, Congress, the Aerospace Industries Association, etc.) have identified an immediate need for positive change in U.S. commercial launch operations. Non-government launch operations at Cape Canaveral are competitively disadvantaged because many existing launch support systems are either limited in availability or severely outdated.

On October 18, 1990, the Authority submitted a proposal to the U.S. Department of Transportation for a modernization and improvement program aimed at increasing efficiency and reducing costs associated with existing commercial launch systems within the Authority's Cape Canaveral territory (which includes all launch complexes on the Cape).

Under the proposal (which was developed with guidance from launch support companies, the Air Force, and universities), a study is planned to assess current launch processing and control needs and determine what changes will be required to enhance U.S. competitiveness. Based on the results of this analysis, in cooperation with industry, universities, the U.S. Department of Transportation, and the Air Force, the Authority then intends to establish a centralized facility and supporting systems capable of incorporating more state-of-the-art technologies into existing (and next-generation) launch vehicles and operations.

This multi-user central facility is proposed to serve all commercial launchers at Cape Canaveral as a vehicle checkout station, firing room, customer data display area, and university/industry development laboratory. Being designed for use by several commercial operators, such a complex would also accommodate the Authority's anticipated development of a small-class launch facility.

The modernization initiative has been presented to the Air Force Eastern Space and Missile Center. Based on initial Air Force inputs, the plan appears compatible with ESMC's long-term planning.

The Authority has already implemented a preliminary step in the program by initiating precursor studies, obtaining commitments from launch support contractors and universities, and including the modernization program in its comprehensive planning efforts.

This initial program outlines the methodology under which the Authority will optimize its services to Florida's commercial launch industry. It recognizes essential Department of Defense and NASA requirements, and will provide a sound foundation for the development of any additional required launch infrastructure.

CAPE SAN BLAS ACTIVATION

The Authority is working with the Air Force to utilize Air Force Test Site D-3A on Cape San Blas in Gulf County to accommodate up to twelve launches per year using small suborbital launch vehicles (sounding rockets). A Request for Proposals (RFP) issued for activation of the site, including procurement and launches of the first six rockets, has resulted in current negotiations with a launch services contractor.

At Cape San Blas (which was an active sounding rocket launch site during the 1950s and 1960s) the Authority will sponsor a Flight Experiment Program for Florida and other universities to stimulate space-related research. This program will provide a Florida capability for upper atmospheric studies and space research efforts, giving a significant advantage (and incentive) to researchers who would otherwise have no or very limited access to experimental data from federally controlled launch systems.

Spaceport Florida's Cape San Blas operations will:

- * Provide timely access to space.
- * Encourage the development of Florida's expertise in design and development of space payloads and supporting equipment.
- * Promote research on environmental monitoring with initial emphasis on Florida's environment.
- * Promote research in other space-related areas which are of interest to scientific and commercial communities.
- * Attract additional funds to Florida for space research and development.

Toward encouraging participation in the Authority's Cape San Blas programs, an initial allocation of six sounding rocket launches will be made available without charge to university experimenters. Other research-sponsoring organizations, such as the Technological Research and Development Authority, have expressed interest in sponsoring the development of payloads for launch from Cape San Blas. Joint university/high school projects are also under consideration, including possible coordination with the Florida Department of Education to develop high school-sponsored launch opportunities which will stimulate students interest space science.

Final price negotiations with a site activation contractor will be completed soon, and a nominal launch readiness is currently estimated for April 1991. In parallel to the site activation activities, and toward ensuring compliance with local and regional comprehensive plans, the Authority and a contracted firm are preparing an environmental and permitting assessment in cooperation with Eglin Air Force Base and the other affected local and state agencies.

After the site is activated and the initial launches are provided, we anticipate that a launch team comprised of university personnel and Authority managers will be developed to conduct subsequent launch operations.

In planning for that transition, Authority staff and other Authority-sponsored university representatives recently completed a sounding rocket training and certification course provided by the Air Force at Cape Canaveral. Participants included student and faculty members from Florida State University (FSU), the University of Central Florida (UCF), and the Florida Institute of Technology (FIT). The courses culminated in a sounding rocket launch conducted by the Authority's Director of Operations on September 27 from Launch Complex 47.

A preliminary launch manifest for operations at Cape San Blas is in preparation. Universities that have shown interest in developing experiments for the sounding rocket program include UCF, FSU, the University of Florida, Embry Riddle Aeronautical University, and FIT. Current planning indicates that a launch rate of approximately six per year is a reasonable expectation.

SPACEPORT FLORIDA LABORATORIES

The Spaceport Florida Laboratories initiative is a cooperative effort between the Authority, FIT, UCF, and Payload Systems Inc. of Cambridge, Mass. The project was formed for the purpose of providing Florida universities with organizational, management, and technical services to support the initiation, design, development, and testing of educational and research payloads. Operated by the Authority, the Laboratories will contain processing areas and specialized equipment.

The Laboratories will be located within a 5,500 square foot facility adjacent to Kennedy Space Center which the Authority will lease from FIT. The facility will also serve as an "incubator" where small and entrepreneurial space firms will share expenses during their startup phases, and have access to the specialized equipment for their business operations.

Many space experiments are developed by universities and small businesses, and most are launched from Cape Canaveral. By providing a facility to accommodate these experiments, including those scheduled for launch from Cape San Blas, the Laboratories will also provide a common center for the streams of scientific hardware and software coming into the Cape Canaveral area for final processing before launch.

INTERGOVERNMENTAL/INDERINDUSTRY COORDINATION

The Authority recognizes the importance of frequent coordination and consultation with the businesses, organizations, and agencies which it serves. Beyond its regular contact with businesses, universities, economic development groups, and local, state and federal government agencies, the following groups have been, or will soon be, established by the Authority to provide appropriate input to its programs.

Technical Advisory Committee

A Technical Advisory Committee (TAC) consisting of one representative from each of the major commercial launch companies, local universities (UCF and FIT), NASA, and the Air Force has been formed to provide technical guidance and consultation to the Authority. The TAC meets at least every two months to identify and discuss launch-related technical issues which the Authority can address as a transportation authority.

The Authority's Infrastructure and Systems Modernization Program proposal to the federal government was coordinated by the TAC, and represents a concerted effort to identify vital infrastructure needs at Cape Canaveral. The TAC will also coordinate with the Authority to perform the tasks required under the modernization program.

University Coordination Committee

Following full activation of Cape San Blas, the Authority will work with the State University System and the Board of Regents to establish a working group of representatives from each university. These representatives will coordinate the development and launching of research payloads from the Authority's launch sites.

Industry Steering Group

Made up of senior representatives from the launch companies, this group will provide an industry policy focus on the Authority's long-term planning.

Aerospace States Association

The Authority has been active in the creation and ongoing development of the ASA, an association of states with interests in space-related economic development and education. The organization's objectives are to develop cooperative space-related economic development and educational programs, and to provide a unified voice in Washington to support mutually beneficial space-related policies and legislation.

The following Statement of Purpose was developed by the participating states: "The Aerospace States Association (ASA) is an association of states -- whose representatives have been appointed by the governors of those states -- advocating strong, competitive, and viable U.S. aerospace commerce. ASA recognizes the importance of aerospace commerce to the economies of its member states, and is bound by strong state government commitment to aerospace education, industry, and research. ASA members are further committed to seek enhancement of U.S. competitiveness in aerospace through commercial innovation, joint programs, co-operation in space-related commerce and space-related advanced technology endeavors, and through information exchange on these topics."

The association's first organizational meeting was held at the 1990 Florida Space Conference, and has since generated strong interest from states including Alabama, Alaska, Arkansas, California, Colorado, Hawaii, Kentucky, Michigan, Mississippi, New Mexico, Ohio, Texas, Utah, and Virginia. Recognizing the ASA's potential to affect space industry development, meetings have thus far been attended by representatives from NASA, the National Space Council, the U.S. Department of Commerce, U.S. Department of Transportation. Established as an ad-hoc group, organizational meetings held in Florida, Colorado, and Virginia are establishing the framework under which ASA will develop and operate.

ASTROTECH SAFETY EVALUATION

In response to community concerns regarding public safety procedures at Astrotech Space Operations (a commercial satellite processing facility adjacent to Kennedy Space Center) the Authority requested that the U.S. Department of Transportation administer a critical review of Astrotech's operations. The study, which was conducted with the cooperation of the Environmental Protection Agency, was completed in August 1990, and delivered during a public hearing to the Authority and the City of Titusville.

While some minor adjustments were suggested to improve information exchange mechanisms between Astrotech and community emergency managers, the study found no significant public safety hazards in Astrotech's current satellite processing operations.

MARKETING EFFORTS

The Authority has participated in various space-related events, including the successful Florida Space Conference and the Farnborough International Air Show, and is planning to participate in other domestic and international events such as the January 8-10 Space Technology, Commerce & Communications Conference in Washington D.C. To achieve maximum economy and exposure during these events, the Authority usually cooperates with the Florida Department of Commerce and other interested economic development organizations, including the Aerospace States Association.

A space-related promotional video and a comprehensive directory of Florida's space capabilities are also planned in cooperation with various economic development organizations and space-related businesses.

Regular contact with current and potential clients is perhaps the most effective part of the Authority's promotional policy. Our approach to meeting the space industry's needs has garnered considerable media coverage worldwide, and has placed great demands on the Authority's staff to brief industry and government decision-makers and participate at various space-related events.

FEDERAL ACTIVITIES

Given the anticipated nationwide impacts of the Authority's programs, and our necessary interaction with space-related regulatory agencies and congressional committees, federal policies and legislation are important to the Authority's success.

The Authority, in cooperation with Florida's Washington Office and Washington Delegation, and the Aerospace States Association, is actively supporting the development and enactment of space-related policies and legislation intended to increase the viability of the U.S. commercial space industry. Our goals in Washington include attaining tax-exempt status for the space infrastructure bonds, and amendments to the Commercial Space Launch Act which will encourage state-sponsored initiatives and creative partnerships to benefit the industry.

Authority-supported amendments to the Commercial Space Launch Act

- * To include within the scope of the Act the establishment and operation of spaceports and related infrastructure.
- * To include within the scope of the Act state governments and state-chartered public entities established to facilitate and encourage space-related activity.

- * To expand the mechanisms established by the Act in order to facilitate maximum private sector involvement in space-related activity.

The amendments, which were sponsored by Florida's Representatives on the House Committee on Science, Space, and Technology, were approved by both the House and Senate in October as part of the 1991 NASA Authorization bill. Essentially, these amendments encourage the federal government and private industry to join together with state governments facilitate space commerce. Until now, federal agencies (and subsequently many private companies) have been understandably tentative in their dealings with state governments because there has been no clear federal policy or legislative recognition of the potential role of states in space-related programs.

The Authority is also seeking tax-exempt status for its bonds by proposing amendments to the Internal Revenue Code which would place Spaceport Florida bonds in the same category as many airport and seaport bonds (which already enjoy tax exemptions).

BONDING PROJECTS

The Authority is to finance appropriate space-related projects. These bonds will not be backed by the State of Florida. Rather, Spaceport Florida bonds will be backed by corporate or government partners in each bond project. Approval for Spaceport Florida bonds must be obtained from the Governor, Cabinet, and House and Senate leaders.

The Authority's Board of Supervisors passed a Resolution of Inducement on October 15, 1990, reserving \$50 million of the Authority's \$500 million in bonding capacity for General Dynamics Space Systems Division. General Dynamics, providing their own corporate backing, will use Spaceport Florida bonds to finance the construction of several launch support buildings required to satisfy their manifest of Atlas commercial launches over the next several years.

Bond counsel for the Authority's financing projects will be provided by Ruden, Barnett, McClosky, Smith, Schuster & Russell. Ruden, Barnett was selected by the Board of Supervisors on November 13 through a competitive process, and will be responsible for assisting the Authority in all aspects of its bond work.

Other bonding projects being considered cannot be specifically discussed due to requests for trade secrecy by the potential partners. The Authority is also discussing the possibility of using Spaceport Florida bonds to finance the development of badly needed federal space infrastructure. The potential for use of Spaceport Florida bonds for such projects provides an innovative alternative to meeting our nation's goals in space.

Toward encouraging participation in the Authority's Cape San Blas programs, an initial allocation of six sounding rocket launches will be made available without charge to university experimenters. Other research-sponsoring organizations, such as the Technological Research and Development Authority, have expressed interest in sponsoring the development of payloads for launch from Cape San Blas. Joint university/high school projects are also under consideration, including possible coordination with the Florida Department of Education to develop high school-sponsored launch opportunities which will stimulate students interest space science.

Final price negotiations with a site activation contractor will be completed soon, and a nominal launch readiness is currently estimated for mid-1991. In parallel to the site activation activities, and toward ensuring compliance with local and regional comprehensive plans, the Authority and a contracted firm are preparing an environmental and permitting assessment in cooperation with Eglin Air Force Base and the other effected local and state agencies.

After the site is activated and the initial launches are provided, we anticipate that a launch team comprised of university personnel and Authority managers will be developed to conduct subsequent launch operations.

In planning for that transition, Authority staff and other Authority-sponsored university representatives recently completed a sounding rocket training and certification course provided by the Air Force at Cape Canaveral. Participants included student and faculty members from Florida State University (FSU), the University of Central Florida (UCF), and the Florida Institute of Technology (FIT). The courses culminated in a sounding rocket launch conducted by the Authority's Director of Operations on September 27 from Launch Complex 47.

A preliminary launch manifest for operations at Cape San Blas is in preparation. Universities that have shown interest in developing experiments for the sounding rocket program include UCF, FSU, the University of Florida, Embry Riddle Aeronautical University, and FIT. Current planning indicates that a launch rate of approximately six per year is a reasonable expectation.

SPACEPORT FLORIDA LABORATORIES

The Spaceport Florida Laboratories initiative is a cooperative effort between the Authority, FIT, UCF, and Payload Systems Inc. of Cambridge, Mass. The project was formed for the purpose of providing Florida universities with organizational, management, and technical services to support the initiation, design, development, and testing of educational and research payloads. Operated by the Authority, the Laboratories will contain processing areas and specialized equipment.

EDWARD A. O'CONNOR, JR.

BIOGRAPHY

Mr. O'Connor, currently Executive Director of the Spaceport Florida Authority, is a native of Chicago, Illinois. Ed and his wife Barbara are residents of Merritt Island, Florida. Mr. O'Connor has over 25 years experience in the aerospace industry with the U.S. Air Force, NASA, the private sector, and state government.

He was educated at DePaul University and accomplished his graduate work at Florida State University. He has a Bachelor of Science in Chemistry and a Masters Degree in Business Administration.

EXPERIENCE

Spaceport Florida Authority, Cocoa Beach, Florida

Since February 1990, Mr. O'Connor has been directing the activities of the Spaceport Florida Authority. The Authority was created by the State of Florida to support the U.S. space program by facilitating a partnership of federal and state governments with the private sector. The Authority is working to support the expansion of commercial space enterprise and is authorized to issue revenue bonds to develop space-related infrastructure including launch complexes and manufacturing facilities, to ensure that space continues to be a key component of the Florida economy.

Martin Marietta Space Launch Systems, Cape Canaveral Air Force Station, Florida

During his tenure with Martin Marietta, (April 1987 to January 1990), Mr. O'Connor was Manager for the Commercial Titan Launch Program. His responsibilities included Program Integration functions at the launch site, and management of payload support requirements in Martin Marietta, government, and commercial facilities. He directed the payload customer service functions, and acquisition of government services under the Commercial Space Launch Act. He was Flight Director, for the first Commercial Titan launch on December 31, 1989.

United States Air Force, Cape Canaveral Air Force Station, Florida

Mr. O'Connor retired as a Colonel in the United States Air Force after a 25-year career. During his final assignment, he managed all aspects of Department of Defense launches, satellite programs, and launch system preparations at Kennedy Space Center and Cape Canaveral Air Force Station. He was Launch Manager for the Department of Defense's STS-51C Space Shuttle mission. Under assignment to NASA, Mr. O'Connor directed, the Search, Recovery, and Reconstruction Team supporting the Presidential Commission investigating the Challenger accident. He was assigned as Senior Manager for the prelaunch processing and launch management planning of 16 major space programs. Several of these programs were identified as "Special Projects" by the Under Secretary of the Air Force and involved the highest level of Air Force security. He was detailed to the NASA Space Transportation System Program Office at Kennedy Space Center to assist in the implementation of initial Orbiter processing and launch capability.

EDUCATION

1975 - Master of Business Administration, Florida State University
Field of Concentration: Research and Development Management

1961 - Bachelor of Science, DePaul University

AWARDS

NASA Exceptional Service Medal
Air Force Legion of Merit
Air Force Meritorious Service Medal
Air Force Commendation Medal
Jerry Letterman Award from the Air Force Association
Canaveral Technical Society Award for Scientific Achievement

AFFILIATIONS

Air Force Association
American Institute of Aeronautics and Astronautics
Executive Member - Space Coast Development Commission
Executive Member - Cocoa Beach Area Economic Development Commission
Executive Member - Brevard Economic Development Commission
Aerospace States Association - (Appointed by the Office of the Governor as Florida Representative)

Mr. NELSON. Thank you, Mr. O'Connor.

Mr. Spreyer.

Mr. SPREYER. Mr. Chairman, Mr. Walker, thank you for providing me the opportunity to appear before you today and to give comments on Hawaii's commercial space development plans. It is, indeed, a treat to be here in this beautiful place, this fascinating facility, and we feel that Hawaii is also a beautiful place and, with that regard, we are happy for all the tourists who visit us on a regular basis, but it would be our desire to diversify beyond that tourism into some other areas.

With that in mind, Governor Waihee, in his first State of the State Address, in 1987, asked that Hawaii investigate the pursuit of a vigorous space industry there and engaged an independent consultant to investigate the potential for space industries in Hawaii.

They came back to us with the startling news that there was the potential for space business in Hawaii and that Hawaii, being the southernmost of the United States, would provide a launch facility which had the capacity or the capability to launch either toward the Equator or toward the Pole. This left us in the position somewhat similar to a 7-foot, 5-inch teenager who might not necessarily want to be a basketball player but it would behoove he or she to at least investigate the potential.

So we moved forward and engaged that same consultant to look into sites for a space launch facility. They came back to us with two sites, both on the Big Island of Hawaii, on its southeast or Ka'u Coast, one at Palima Point and the other Kahilipali Point. These are sparsely populated areas, largely lava field.

Then, in 1987, the Governor formed the Office of Space Industries in Hawaii and, in 1989, the Hawaii Space Development Authority, which is headed by Admiral Tom Hayward.

The State Legislature of Hawaii provided funding for an environmental impact statement and assessment of the two sites, and a master plan for a commercial space facility in Hawaii. All this to say—These, by the way, would be completed in draft form some time in the middle of next year and in final form by the end of 1991.

This is to say that Hawaii is serious about its attempt to provide an environment conducive for a commercial launch facility in the State. This is not something which Hawaii enters into lightly. We realize that there are many issues to be addressed and we are using the time of the environmental impact assessment to address them and to make sure that our residents are protected and happy with our decisions.

We have been, as Mr. O'Connor has said, participating in several associations in Washington in this last year, among them the Competitive Alliance for Space Enterprise, which was an alliance of companies, States, and interested parties who made recommendations to the National Space Council regarding space policy, and also sent those comments along to Mr. Augustine's panel working with the National Aeronautics and Space Administration. We are also working with the Aerospace States Association, and the January meeting of that group will be in Honolulu.

We do see a market for a new space facility. We are optimistic that there will be a need for one. We are looking right now at

small expendable launch vehicles and keeping an eye on the medium expendable launch vehicle market, with the potential that that may change.

Previous to involving myself in this I was in the oil business, so when people say that—when people prognosticate, I've sometimes turned a jaundiced eye because I have so often seen prognostications prove incorrect. We think that there will be this SELV market. The medium launch market, we feel, may come along.

Besides, the Hawaii facility is envisioned as an international commercial facility, which would provide launch capability for nations—for vehicles of nations other than just those of the United States. So an MELV market may be appropriate in Hawaii because of such a capability.

In any case, we intend to pursue the atmosphere for siting such a facility in Hawaii, in the coming year in Washington, and to pursue it around the world, which is Admiral Hayward's job, and to make the atmosphere conducive for it in Honolulu. We hope that we can influence national policy to the degree that there will be a Hawaii commercial space facility, and we feel that it would be an important part of the future of the U.S. commercial launch industry.

I thank you.

[The prepared statement of Frederick C. Spreyer follows:]

Envision Hawaii!

dbed

Remarks of Frederick C. Spreyer

Before the

Subcommittee on Space Science

and Applications

on

The Commercial Expendable Launch

Vehicle Industry

Kennedy Space Center

November 30, 1990



Chairman Nelson, members of the Subcommittee, I am Frederick C. Spreyer, Director of the Washington, D.C. office of the State of Hawaii Department of Business, Economic Development, and Tourism (DBED). The Hawaii Space Development Authority (HSDA) is a part of DBED.

The Hawaii Space Development Authority was established by the Governor of Hawaii in 1989. HSDA is supported by the Office of Space Industries (OSI), which was established in 1987. In his 1987 State of the State address, Governor Waihee called for the pursuit of a vigorous space industry in Hawaii as a part of our effort to diversify the Hawaiian economy. In March of that same year, DBED commissioned the consulting firm of Arthur D. Little, Inc. to study the potential for space industry in Hawaii and identify significant opportunities for Hawaii participation in this industry.

The A.D. Little report indicated that Hawaii was already a significant player in space commerce -- for example the activities of the Mauna Kea Observatory and the Haleakala facility -- and, A.D. Little went on to say, there exists a significant opportunity for Hawaii to develop the first international commercial launch facility in the United States.

DBED then contracted with A.D. Little a second time and asked that they study the suitability of various launch sites in the State and report on the most suitable. In April 1988, a report on

the "Selection of a Location for a Space Launch Facility in Hawaii" was submitted to the Hawaii DBED.

The Report recommended two sites, both in the Ka'u district of the island of Hawaii (the "Big Island"), Palima Point and Kahilipali Point. The Ka'u district is on the southeast coast of Hawaii. A.D. Little envisioned -- on this sparsely populated coast -- launch support facilities, new public shoreline access, and up to four launch pads -- each capable of launching small to medium sized expendable launch vehicles (ELVs) easterly into equatorial orbit or southerly into polar orbit.

OSI and HSDA are presently preparing a Master Plan and an Environmental Impact Statement (EIS) on the Palima Point and Kahilipali Point sites on the Big Island and on the launch facility proposed for one of the sites. The EIS is being completed in cooperation with the Office of Commercial Space Transportation of the U.S. Department of Transportation. Thus, the resultant "joint EIS" will meet both Federal and State environmental requirements. The draft EIS is expected to be issued for public review in mid-1991, and the final EIS submitted to the Governor for acceptance by the end of the year. Funding for the EIS and the Master Plan is from State funds approved by the Hawaii State Legislature.

The major goals of the OSI and the HSDA are:

1. To pursue the establishment of a commercial rocket launching facility in the State of Hawaii;
2. To identify and promote space educational and public information programs;
3. To mobilize public and private business and scientific and technological resources to help bring about commercial space activities in Hawaii; and
4. To enhance the role of Hawaii as an international center for "networking" expertise in the space industry and for promoting and coordinating space-related joint ventures between the U.S. and other Pacific Rim nations.

OSI has supported the establishment within the State of Hawaii of the Pacific Space Center, a nonprofit institution. PACSPACE was established to link technical expertise resident in Hawaii and the Pacific Basin with space research and development opportunities from around the world.

PACSPACE is currently working with NASA Ames to identify R&D programs which could be supported by Hawaii-based firms. Potential projects include the remote operation of sensing instruments, applications for automated processing of remote sensing data, and the development of an automated lunar prospector. Additionally,

PACSPACE has received a federal grant from NASA under the Advanced Communications Technology Satellite (ACTS) program to design an innovative telecommunications program linking Hawaii with the U.S. Mainland.

The economy of the State of Hawaii has been based on three things: tourism, defense, and agriculture -- specifically, sugar. The proposed Hawaii commercial spaceport represents one of several efforts of the State Government to diversify the economy of Hawaii to include technology-related industry to provide a diversity of employment opportunities for Hawaii residents (others include financial exchanges and services, and telecommunications computer software development and applications).

Hawaii, which is the southernmost of the United States, offers natural geographic endowments which make it a natural site for space-related activities. Hawaii lies near the middle of the Pacific Ocean, some 2500 miles from the U.S. Mainland. This geographic position allows for launches either toward the pole or toward the equator without endangering inhabited land masses. Hawaii is the only place in the United States which will accommodate launches in both of these directions. Cape Canaveral can accommodate only equatorial launches. So Hawaii is a bit like a 7' 5" teenager. He may not become a basketball player, but it would behoove him to investigate the potential, which is what Hawaii has been doing in terms of space.

The Hawaii Spaceport will be unlike any other. It will be completely new, incorporating the latest technology and accommodating new launch vehicles as they are developed. It will build on what we have learned from the past in facilities such as those at the Cape and on what we know of the future and the requirements of truly commercial launches that will take place from Hawaii. It is envisioned that the Hawaii Spaceport will also be international -- both in its clientele and in its ownership. The launch pads and outlying facilities will be designated as a foreign trade zone (FTZ) allowing for movement into the zone without incurring U.S. Customs duties.

The plan for a Hawaii spaceport is built with the protean character of the ELV launch market firmly in view. Among the conclusions contained in the September 1990 Aerospace Industries Association (AIA) Report to Secretary of Transportation Skinner on "Commercial Space Launch Infrastructure" are the following: "The infrastructure requirements and vehicle developments for foreign commercial competitors are being entirely underwritten by their respective governments. The intense price competition by these foreign ventures makes it imperative that the federal government directly fund improvements to the domestic space launch infrastructure and vehicle technology."; "Fundamental business conditions and lack of a stable national commercial space policy argue against financial participation by the commercial space

industry in a new spaceport. Any additional cost pass-through to the customer that would be needed to finance a commercial spaceport is counterproductive to U.S. commercial ELV competitiveness."; "Growth in the small ELV market is uncertain, but costs for developing a spaceport to accommodate these launches is much lower than for medium and large ELVs and development time is much shorter. There may be need for multiple small ELV spaceports depending on which direction the market develops."; "It is premature for a firm decision to be made on federal funding of a commercial spaceport for medium and large ELVs...Over the next 2 to 3 years, national policies regarding international competition can be evaluated."; and "DOT should closely monitor the development of small ELV markets. If it becomes clear that commercial markets will develop, competition among interested state governments should be held with sufficient lead time to enable development of necessary infrastructure under some form of federal/state relationship." The AIA report was commissioned by the Secretary through the advice and guidance of his Commercial Space Transportation Advisory Committee (COMSTAC), whose membership consists of industry participants.

These conclusions merely bolster our enthusiasm for a Hawaii-based commercial launch facility. The Hawaii Spaceport is being designed for the newest technology in small expendable launch vehicles (small ELVs), which we feel will provide a market sufficiently large to support a newly constructed space launch

facility in Hawaii during this decade and into the next century. The Hawaii facility is planned to incorporate the most modern and efficient technology so as to facilitate small ELV launches into either polar or equatorial orbit. Both support and launch facilities are being designed to optimize launch capacity, safety, and efficiency. We are also keeping in view developments in the medium-size expendable launch vehicle (medium ELV) market. The Hawaii spaceport is envisioned as an international commercial space launch facility, and medium ELV launches of the vehicles of other nations -- especially Pacific Rim Nations such as Japan, Taiwan, and South Korea -- may widen the medium ELV market to support a Hawaii facility. We think that a Hawaii-based facility is necessary to the vitality of the U.S. commercial space industry and important to our national security (by allowing for decreased congestion at military launch sites, e.g. from Cape Canaveral). DBED, through the HSDA and OSI, intends to press for the establishment of a Hawaii spaceport; and, in the coming year, we intend to take our case to the Congress, to the White House, and to the DOT and the DOD.

Hawaii has been an active participant in the formation of the Aerospace States Association (ASA), and we will be hosting a meeting of that group in Honolulu in January of 1991. We have participated in the Competitive Alliance for Space Enterprise (CASE), which has recently submitted recommendations on commercial space policy -- including recommendations on commercial launch

infrastructure -- to the National Space Council. We intend to ask for time to present testimony before Congress on commercial launch infrastructure in hearings to be held during the 102nd Congress, and we intend to work with DOT and any other appropriate agencies to see that Hawaii is given proper consideration for support for commercial space infrastructure development.

In remarks before the American Astronautical Society (AAS) at their 1990 Annual Meeting in Los Angeles, Dr. Mark Albrecht, the Executive Secretary of the National Space Council, said,

"First we will develop our space launch capability as a national resource. As the Vice President has stated, this infrastructure will be to the 21st century what the great highway and dam projects were to the 20th. Let me remind you that the federal government has spent about \$600 billion this century developing our road system. This system helped power America's economic predominance this century. We must begin now building the 'road system to the stars,' for it will do the same for us in the 21st century."

In her comments before the Advisory Committee on the Future of the U.S. Space Program, presented in Washington, D.C. on November 19, 1990, Deputy Secretary of Transportation Elaine Chao said,

"The viability of commercial space transportation will be determined in part by the government's ability to assure a free and fair trade environment in space services."

Hawaii will be a part of America's space future. The navigational skills that brought the fragile outrigger canoes of the Hawaiian people across the wide Pacific to these islands will send probes into space to bring back their rewards. A newly constructed commercial and international Hawaii spaceport is a part of the future of the U.S. commercial space effort, and we ask that national space policy take that into account in word and deed rather than foreclose on the future for a shortsighted present expedient.

Thank you for your attention.

Biography: Frederick (Rick) Spreyer

Director of the Washington, D.C. office of the State of Hawaii Department of Business, Economic Development, and Tourism (DBED) since its opening in September 1987. He has worked for the U.S. Synthetic Fuels Corporation, the Permanent Subcommittee on Investigations of the Senate Governmental Affairs Committee. He is a former vice president of federal affairs for Pacific Resources, Inc. of Honolulu.

Frederick C. Spreyer
1511 K Street, N.W.
Suite 519
Washington, D.C. 20005

(202) 393-6757
Fax (202) 737-3704

Mr. NELSON. Thank you, Mr. Spreyer.

Mr. Walker.

Mr. WALKER. Just to clarify, based upon some previous questions, Mr. O'Connor and Mr. Spreyer. What do you anticipate the bond rate being that you are talking about?

Mr. O'CONNOR. Well, at this time we are pursuing the potential for a tax-exempt status on the bonds, which would obviously improve the rates. We are looking at spaceports as being very similar in nature to airports and to seaports. They have already been granted tax-exempt status. We're looking for recognition that spaceports, as a new transportation mode, fit in that same category.

We've had preliminary meetings with Treasury. In all likelihood, in their mind, it's going to require legislative action for correction, to make sure it is precisely included.

The rates for municipal bonds of this category have been typically very favorable as compared to typical bank rates for a direct loan for a major company. Those rates change on a daily basis. We had great interest expressed in our initial bonds and it would anticipate probably somewhere between eight and nine percent.

Mr. WALKER. Why would you not go the municipal bond route? I mean, wouldn't you, as a State, be able to designate this as something which would reflect municipal status and, therefore, could get a municipal bond rate for it?

Mr. O'CONNOR. Not the way the current tax regulation is written. The facilities we're talking about in most cases would be something that would be utilized by a single manufacturer, such as General Dynamics, to process their vehicle.

Mr. WALKER. I understand. But couldn't you, for example, declare it as something which would be advantageous to the municipality and then, instead of having General Dynamics own the facility, for instance, lease it back to them and have it as a public property, which is on a lease-back arrangement, and therefore get far more in the way of favorable bond treatment?

Mr. O'CONNOR. In talking to the Treasury Department, and looking at the Treasury regulations, seeing it would be predominantly for a single user, and seeing there is not, in general, for these facilities public access, in the sense there is for other activities, and in that we are not applying a taxing base to pay for these facilities—they would be paid for by the corporations using it—they consider it a conduit issue. Under a conduit issuance, it would be subject to the cap limits on each State.

Looking at the overall needs of municipal activity within the State of Florida, because of our population growth, we feel it's an inappropriate use of the cap for bonding, to use these as a tax-exempt municipal bond of that sort. I think it's more appropriate to go for the legislative relief afforded to airports and seaports.

Mr. WALKER. Well, let me explore that just for a moment.

So, in other words, the main problem with what I was suggesting is probably the cap more than anything else?

Mr. O'CONNOR. That is a predominant problem.

Mr. WALKER. So if we removed the cap for purposes of spaceports, that would also help?

Mr. O'CONNOR. Yes, it would also help.

Mr. WALKER. Okay.

What are the financing arrangements you're looking at in Hawaii?

Mr. SPREYER. It's contemplated right now that there would be private financing from a consortium of companies, and with some help from the Federal Government.

Mr. WALKER. How much Federal money would you be looking for?

Mr. SPREYER. Well, that would depend upon the design of the spaceport, and that's still in the final stages. I would say that somewhere—well, I would just as soon as say that at the master plan.

Mr. WALKER. Okay. Well, let me ask this and put it this way.

If we gave you policy relief rather than specific cash, such as of the type that we're talking about, gave you the opportunity to use the tax-free municipals, gave you the opportunity to utilize the financing for industrial park activities and so on that we've done in the past, would that be an incentive for you to go a different route?

Mr. SPREYER. Well, it would certainly be an incentive for us to look at that route. And, in candor, I mean we have a marvelous lava field out there whereas Cape Canaveral, despite its rotary dialing, does have something there already. So there may be some difference.

Mr. WALKER. Yeah.

Are you looking for substantial international contributions in that private financing mechanism?

Mr. SPREYER. Yes. Not above 50 percent, but yes, substantially.

Mr. WALKER. So in that particular case, the Federal Government would end up being a partner in a substantial international enterprise as well, if we were contributing to it?

Mr. SPREYER. That's correct.

Mr. WALKER. Thank you, Mr. Chairman.

Mr. NELSON. Thank you, Mr. Walker.

What is the status of your request, Mr. O'Connor, to the Department of Transportation for a \$25 million, three-year grant for infrastructure improvements at the Cape?

Mr. O'CONNOR. We recently received a letter from the Office of Commercial Space Transportation stating that in their authorization, as it exists today, that there is no grant money available, that their total budget for this fiscal year is on the order of \$3.4 million.

They are in the process at this time of looking elsewhere within the Department of Transportation. We have no assurance at this time that they will be able to find that money, although we are very hopeful that they will.

Mr. NELSON. What legislation do either one of you feel is still needed to make your program a success, and will you be requesting that legislation?

Mr. O'CONNOR. From Florida's perspective, we are preparing legislation right now to clarify the tax position of municipal bonds that we may be issuing. We are also looking for a clarification in some language that would identify more clearly our role in partnership with NASA and the Air Force as a State agency in commercial space activities.

We would also look forward to seeing, within the Department of Transportation budget, the establishment of a grant program to facilitate this transportation mode much as they have aviation and rail and shipping. That does not exist at this point in time. Those would be the three predominant areas we would look for assistance this year legislatively.

Mr. SPREYER. We would be working with Florida as we have last year, and we feel that when we can make a cooperative effort, it will gain a greater constituency and a greater likelihood that something will be passed. We support all of the things that Mr. O'Connor has said, but most especially the last, that is, a fund within the Department of Transportation for development of this infrastructure.

Mr. NELSON. Do you feel that that latter is essential to your ability to move forward, and what do you envision the use of that \$25 million appropriation if it were to be successful, being a grant from DOT to you? And I ask that to both of you.

Mr. O'CONNOR. It would probably be useful for me to describe how did we get to a dollar value of \$25 million.

We are looking at a facility that is going to be—and a program—that would be more expensive than that. We're not looking for total Federal funding. What we're looking for is Federal participation. Our State university system has pledged \$9 million in assistance through university assistance, building activity, land use. Our Brevard county government has donated 25 acres of land in the vicinity of the Cape Canaveral Air Force Station for use to build facilities like this. We are also looking to industry to participate through paying any bond costs that are associated with other supplemental funds that will be necessary.

What we're trying to do is develop a system where the Federal Government participates financially to the degree that they benefit from the program. We try to establish that looking at the overall projected reduction in launch costs of the new facility, reduction in maintenance, reduction in the people, and a coordination with the new Test Operations Control Center and its efficiencies would result in a quick savings for all parties, and specifically the Federal, of at least \$25 million. Therefore, we were looking for partnership arrangements for all of our projects, where each beneficiary of the project contributes a proportionate share.

Mr. SPREYER. We were looking at a similar thing. As we are concentrating initially on small launch vehicles, it would, it seems to us, provide an opportunity to develop a state-of-the-art facility in that area and that the Federal Government would be interested in participation with private industry and with the State, the State's participation being in some yet-to-be-defined form. But that's what we would look at.

Mr. NELSON. From the discussion this morning on Panel 1, it certainly seems that it's in the interest of all parties to get Federal participation, not just from the Department of Transportation but from NASA and the Department of Defense, because if the cost of a launch is brought down, certainly NASA and the Department of Defense are going to be two of the immediate beneficiaries of that reduction of cost, whereas the role of the Department of Transpor-

tation has been the organization that we set up under the 1984 Act that was going to permit the commercial launches.

Do you have any clue into the attitude of cooperation among these agencies in the way that you've dealt with them, and is there anything that you could recommend to the Congress on lack of cooperation that ought to be encouraged? What is your experience there?

Mr. O'CONNOR. My experience has been the typical experience you would expect with a new organization stepping into this environment, so you first go through the familiarization process.

We've gone through that, I believe, very adequately now with the Air Force, and we understand the mutual interest of all parties involved. We're getting a great sense of cooperation here with Cape Canaveral Air Force Station personnel, with the ESMC Commander, looking at us as being a partner with them and working with them. But we are talking areas of innovative financing, if you would, joint participation in new forms, a need for a more creative environment to go into the future of this transportation mode.

To the degree that we have to develop new policy that deals with that, the degree that we need to recognize that new mechanisms will be needed in the future, I think encouragement from the Congress that these things are areas to be encouraged, to be sought out, looking for new partnerships and new ways of going forward, I think that encouragement is important because it is a new way for both NASA and the Air Force to cooperate and operate within the environment that they've always been basically the sole occupants.

Mr. NELSON. Mr. Spreyer?

Mr. SPREYER. Thank you. I have no great complaints about any of the agencies. I suppose the Committee for Competitive Alliance for Space Enterprise did make the recommendation that the agencies might work together more effectively with a little greater harmony of purpose, but I would echo Mr. O'Connor, that some encouragement from the Congress and some possible guidance from the Congress would be helpful in their carrying out what at least we might consider to be their mission.

Mr. NELSON. Well, I think the record built this morning amply demonstrates that, for the sake of the country, not just for the sake of DOD or NASA or DOT, that for the sake of the country, if we can bring the cost of launch down by all of these updating and modernization techniques, then we've certainly added to our ability to be competitive on the world market.

Mr. WALKER. Can I ask one more question—

Mr. NELSON. Sure.

Mr. WALKER. This just struck me as you started talking about partnerships here.

Have either of you done anything about seeking out other States to cooperate with you in your spaceport concept?

Mr. O'CONNOR. Yes.

Mr. WALKER. In other words, you know, there would be advantages to Florida and Hawaii looking at this largely because you're seen as places from which launches can be done. There are many States in the Union that would like to be involved in the space business but obviously are never going to be launch sites because of the geography involved, but might want to be engaged in the proc-

ess with you. It seems to me, instead of just having a Florida Spaceport, that it might be a partnership of several States that would be involved in the spaceport activities with certain support services being provided in those States to launching capabilities here.

You answered that yes, that you are, in fact, involved with other States in looking at those kinds of partnerships?

Mr. O'CONNOR. Definitely. In June of this year we had a space conference in Orlando, and at that time we asked other States that we thought would be interested in forming relationships like that to participate with us, with a discussion of how can we start forming linkages like that.

Out of that meeting came an organization that is now forming, the Aerospace States Association. Basically now we have 15 States interested, where we're looking for partnerships like that. In all likelihood, it would not be a financial partnership. It would be technology partnerships. We're vitally interested in the efficiency of manufacturing in Southern California at the General Dynamics plant and McDonnell Douglas plant.

The lower the cost of the manufacturing in those States, the more competitive their position will be, and if we, in turn, reduce the cost in our State, that helps. I believe, with time, we will find other partnerships evolving where we may want to jointly go on and take a specific task or a specific technology on, find ways to share the cost of that across State boundaries. We haven't reached that step at this point.

Mr. WALKER. And is there anything which is specifically preventing you from doing that?

Mr. O'CONNOR. I don't believe so, except probably historically that hasn't happened. We are participating right now with Hawaii in a joint buy of sounding rockets. We initiated a procurement action for six of them, as we talked earlier, and as Orbital Science mentioned in their testimony. There is an option on that particular contract for three sounding rockets to be launched from Hawaii that we would make available to them and assist them in acquiring those systems for their use.

Mr. WALKER. Is there anything we could do at the Federal level that would encourage States to come together in consortiums to advance essentially commercial activities?

Mr. O'CONNOR. I don't believe I could think right now of any legislative need. I think, as a policy statement, encouragement back to the States to work together, that they are a necessary partner in this industry, I think that would be a very good message to send.

Mr. WALKER. Mr. Spreyer.

Mr. SPREYER. I think meeting with the Aerospace States Association in the coming legislative year and working out among staff members in the Congress what the hopes for these States are in terms of aerospace, and gaining a greater constituency for these issues before the Congress is what we would hope to do. And then that may lead to some specific things which might be done legislatively.

Mr. WALKER. Well, for instance, say it requires encouragement, is there some sort of resolution that we ought to pass that maybe would just encourage the development of these activities? I mean,

you know, if that's something which would be useful, and certainly something that would be reasonably easy to do, I think, and something that our committee might be interested in as a way of just helping to advance the concept. And so, you know, it may be something that your organization may want to come up with some language that you send to us at some point that would provide some encouragement at the Federal level. It could be a memorializing kind of thing, but nevertheless, if that would be useful, it certainly seems to me that's something that could get done.

Thank you, Mr. Chairman.

Mr. SPREYER. I appreciate that offer.

Mr. NELSON. I might point out what we adopted in the NASA authorization bill this year, that I think has been signed by the President and into law now—and it's directly on point—one of the general responsibilities of the Secretary of the Department of Transportation is to work to facilitate private sector involvement in commercial space transportation activity and to promote public/private partnerships involving the Federal Government, State governments, and the private sector, to build, expand, modernize or operate space launch infrastructures.

Mr. WALKER. I am familiar with that, and I think that was done with the encouragement of some of these folks, that we work that in, and you were instrumental in it. I think that's good stuff. My guess is that what we're talking about here is a little more broader kind of statement that would actually get into some specifics of the kinds of things that are going on out there and so on, you know, without specifically directing policy in any way, but simply recognize what's going on. My guess is that we can do that and that we can build off this language a little bit. Because this is good language. I think it's the first time that we've moved in that direction.

Mr. NELSON. Yeah. The words "complementary facilities" were in there, that we encourage in the private sector and the State governments, and that could get into the whole realm of education and so forth that we're talking about here.

Let me ask Mr. O'Connor, in this report that I referred to earlier here by the Association of Aerospace Industries, it noted that the current requirement of commercial launchers is that they pay only the direct cost to the Government range, and because of that, they concluded that a commercial spaceport for heavy and medium weight launch vehicles, not small, heavy and medium weight would not be a viable option—to go out and build one new because of the cost.

Do you agree with that conclusion?

Mr. O'CONNOR. I've read that report and I agree substantially with it. I think we have to look at the perspective of the industry at this point in time. That perspective is a perspective of a heavily subsidized, international competitive market. There has been a degree of market allocation, such as with the Chinese, where they were given direct permission to launch a certain number of U.S. payloads.

There is now the technology transfer license for Cape York. I think that has put a lot of U.S. companies in a mode of being very cautious about further investment in how big this marketplace is going to be. I share many of those concerns.

From that perspective, when I look at Cape Canaveral Air Force Station and I see the facilities there, I see a greater need to modernize what we have than to go forth right now and build brand new. I think, if we modernize and we begin that process, I think we will encourage industry, I think we'll encourage investors, to take that next step to say now it makes sense to go and build a new launch infrastructure, have commercial spaceports, in the more isolated sense of here is a dedicated facility that will be utilized just for commercial activities.

Mr. NELSON. All right.

By the way, the next panel perhaps can give us some clarification on—I believe that technology utilization export license that you're talking about with regard to Cape York has been put on hold. Let's get that specifically given to us in the next panel.

Let me ask Mr. Spreyer. In a construction of a spaceport in Hawaii, to what degree of international investment would you anticipate? You were talking about an international spaceport.

Mr. SPREYER. We would fully look to a minimum of a quarter of the cost of that facility.

Mr. NELSON. One quarter?

Mr. SPREYER. One quarter.

Mr. NELSON. If you're going to build a spaceport from scratch, you're talking about a lot of money, less if it's just for small, considerable if you're talking about medium weight and heavy lift, to the point that here General Dynamics told us that they just spent \$100 million just upgrading the facilities that were already here. So we're talking about big bucks.

Given that financial investment to build a spaceport, would Hawaii seek to get Federal funding for the construction of such a spaceport?

Mr. SPREYER. We certainly would, yes, sir.

Mr. NELSON. And that would be part of the three-quarters, plus you're saying one quarter that would be foreign?

Mr. SPREYER. Well, we wouldn't ask for three quarters of the amount from the Federal Government, no. But I would suggest that up to a half.

Mr. NELSON. All right. I want to make sure, Mr. O'Connor, that I understood your answer, on whether or not you did or did not agree with this report that said it's not going to be cost effective to go out and build a completely new spaceport for medium and heavy lift vehicles.

Mr. O'CONNOR. I agree with that report to the extent that today's technology, if we went out to duplicate that, would not be the right answer, would not warrant going forward. If we have, out of the ALS technology programs, new ways of launching, and simplification of systems, more efficient ways of doing the business, at that point in time it may justify it. Technology is not here today and available, I believe, to make a heavy lift or medium lift commercial spaceport a viable activity.

Mr. NELSON. Gentlemen, it's been very enlightening. We appreciate this participation.

I want to call up the fourth panel on international competition. We're pleased to have Mr. Don Mirth and Mr. Joe Del Riego. Mr. Mirth is the Senior Vice President of U.S. Boosters Incorporated,

and Mr. Del Riego is the Director of Marketing for the Space and Communications Group of Hughes Aircraft.

Two nights ago I had the pleasure of talking to their colleagues and their company, and they were quite interested about the fact that you all were going to be coming here and testifying today.

Let me ask you to share with us, in a summary form—your written statements are a part of the official record. So we'll start with you, Mr. Mirth.

STATEMENTS OF JOSEPH DONALD MIRTH, SENIOR VICE PRESIDENT, UNITED TECHNOLOGIES CORPORATION/USBI COMPANY; AND JOSEPH DEL RIEGO, DIRECTOR OF MARKETING, SPACE AND COMMUNICATIONS GROUP, HUGHES AIRCRAFT COMPANY

Mr. MIRTH. Okay. Thank you, Mr. Chairman. We're delighted to be here today.

First of all, we have changed our name. We are now USBI Company rather than the United Space Boosters, as we used to be. As I said, we're delighted to be here, and I really appreciate the opportunity to come before you and tell the story of the Cape York Spaceport.

I was recently very privileged to host Chairman Roe and Representatives Volkmer, Hughes, McMillen, Hayes, and Bill Smith was with us in Australia. And, Mr. Walker, we're sorry you had to cancel at the last minute on that. We understood that you were going to come.

We had the opportunity to go from Cairns, which is the nearest small city, on up to the spaceport, to the projected site for the spaceport. It took us a two-hour airplane ride and then another 30 minutes on a helicopter. We did stop at three different spots at the spaceport, and we found just about what we expected to see, and that was that there's nothing there. There is probably not a shack for 25 or 30 miles.

However, as far as the topography is concerned, it looks like it will be an ideal place to build a spaceport. You don't have to worry about running into water when you dig down six feet, like we sometimes have the problem here, or moving mountains like we have had to do out at Vandenberg. So we were encouraged by it, I believe, and I think most of the members and Bill were also by the site.

Mr. Roe, while he was there, was certainly an articulate and forceful spokesman for—in terms of his support for the joint Australia/U.S. venture in the international spaceport and participation in the program. We again, and the Australians, were very appreciative of the opportunity to share our excitement and enthusiasm for the program with them.

I would like to move pretty quickly through my formal presentation—and it's not consistent, or totally consistent with what I've submitted. You may want to use the viewgraphs and just flip through them as I go through this verbal presentation, and I do that because I primarily want to focus on a couple of very important points.

We started to explore this program in 1988 with Cape York Space Agency, which is a private, not government agency. Because

of the name, people have a tendency to confuse it with a government agency, but it is not. It's a private commercial organization. But even prior to that time, a number of investors had spent a considerable amount of time doing extensive studies regarding the feasibility, the markets, the sites, the launch vehicles, configurations, costs, et cetera. They felt that—and there were a number of consultants from all over the world, people with a great deal of experience that assisted them in this. They felt that the studies turned out positive, and there is a good potential that a private commercial organization, such as the Cape York Space Agency, could establish a spaceport without government subsidy and still make money.

First of all, why Cape York? Why was that selected? It is very close to the equator; it's within 11 or 12 degrees of the equator. It is probably one of the most compatible places on the earth close to the equator, with the solid support of government, clear launch zones to the east, relatively moderate weather—a little bit hot, but not really that bad.

The vehicles launched from Cape York will enjoy about a 15 percent lift advantage over the same vehicle launched from, for instance, here at the Cape, and the advantage is significantly more for those launched, for instance, at Baikonur out of the Soviet Union.

The Zenit launch vehicle, for instance, from Cape York will lift more to geosynchronous orbit than the commercial Titan from the Cape, so it competes at the very high end of the lift capability scale. The Cape York Space Agency primarily sees the competition as Ariane. That one chart there will show you the lift ranges for Titan and Ariane IV.

The business arrangement is one in which Cape York Space Agency will act as the financier and raise the equity in the program. They will hold primarily two contracts. One of them will be with USBI to manage, develop, activate and operate the spaceport, plus we will have the responsibility for assembling, testing and launching the Soviet booster. In addition, we will market the service worldwide and, very importantly, we will do all of the mission planning and the payload integration. That really means that western satellites, the manufacturers, will be able to interface with an American/Australian organization for the payload integration.

The other major CYSA contract will be with the Soviets for the supply of launch vehicles, automated processing, and launch equipment, and then the training of the U.S./Australian crews and, of course, all the tech data that goes with it. The Soviets will not be present at Cape York after the first two launches, so there will be no Soviet presence there during the operation.

Mr. Chairman, who would have dreamed three or four years ago that the Soviet Union would agree to train U.S. and Australian technicians and engineers in their launch vehicle—in their newest launch vehicle, really. It's really an exciting opportunity.

Just a few words regarding the Zenit. Mr. Mihara expressed the capabilities very well. But it's a straight-forward LOX kerosene engine, single engine, with four thrust chambers. One of the interesting aspects is that, as was mentioned before, it was a clean sheet of paper design, the first launch in 1985. So it really is just about

the newest booster, space launch booster in the world today. It's built to process the vehicle safely, reliably, and expeditiously, with fully automated robotics systems. The vehicle rolls out to the pad and it's all automated and all robotically made, all umbilicals and so on. There are no men around. It's then erected and launched within 24 hours. Then another one can be launched about four days later, a real rapid turnaround.

All of this the Soviets claim can be done with about 150 people, and that's pretty significant, and especially so when you're comparing costs with the manpower-intensive, vertical, integrated types of systems that have been the standard for decades and are still in use today.

I would like to focus on cost a little bit further, because whenever this system is mentioned, and the Cape York scenario is mentioned, cost is, of course, one of the major factors that's brought up.

There are a number of cost elements that go into determining the price that's charged for a launch, and that's delivered to orbit. The launch vehicle hardware is only a part of that cost. Since the Cape York scenario is really a commercial venture, and there are no government subsidies, everything must be paid in full by the developer and operator. This means the establishment of the town, the port, the airfield, the range, the infrastructure, et cetera, has all got to be paid from the proceeds. The operation and upkeep must also be paid as the program moves ahead.

There is no military base from which to operate up there. As I said before, there's nothing up there. There's no range existing to share with others; there's no government funding or tax incentives. There are no government-funded or built launch facilities, ground support equipment, et cetera. The costs must all be covered by the proceeds.

When you add all of these factors, many of which are nonexistent at the current launch facilities, you'll find that the cost of the launch, the cost of the total package, really, will be roughly comparable but competitive with the current prices charged today.

I can't tell you what that price is because we haven't been able to engage fully because of the delay in the license. We applied for a license last October, a year ago October, and that license is still in process. Because of that factor, I haven't been able to get my technical team over there to really do a scrub on the costs, so I can't give you a number. But I can assure you that it will be roughly comparable and competitive with what we see today.

It is important to understand that when we talk about comparative cost we must make sure we're comparing total cost packages and not one element, versus a total package as is frequently done in discussions regarding the Cape York scenario. Sometimes you see the cost, the assumed cost of a Soviet launch vehicle compared with the launched-into-orbit cost of other vehicles. You can't do that. That's not reasonable.

There are a host of benefits to the U.S. participation in this program, and I would like to highlight a few of them.

One of the U.S. Government provisions to the USBI license approval is that the Soviets would limit all of their launch vehicles to one site outside of the Soviet Union. Now, that simply means that we would not see, for example, Protons in Brazil, or Zenits in Indo-

nesia, or other systems elsewhere. If the U.S. doesn't participate in this program and the Soviets do not agree to that provision, we could see their launch vehicles scattered around the world, and the launch facilities, ranges, et cetera, could be fully subsidized by the governments around the world. This would further exacerbate the problem of significant launch price cutting. It has that potential.

The other provisions of the U.S. policy would require a Soviet/U.S. agreement that would control the worldwide proliferation of missile and launch vehicle technology and potentially additional competition in the future. The missile technology control regime is one of the provisions in the license application, and that is currently being negotiated with the Soviets, that and the exclusivity portion of the provisions.

By allowing a U.S. firm to participate in this program, the U.S. Government will open up a host of other business opportunities to U.S. industry. The possibilities run the gamut from upper stages, or third stage. Right now there's a strong possibility that that could be any number of different types of systems. And as I said before, it runs the gamut all the way down to hardware for the town site, air conditioners and elevators and things like that.

In addition, there will be export opportunities for U.S. satellites integrated by a U.S./Australian organization and, of course, the launch service supplier will have the export opportunity also.

The Australian Government has tentatively agreed that there will be significant offset credits that could be generated by this program, and, of course, that results in keeping dollars and jobs here in the U.S.

In summary, our evaluations to date indicate that the Cape York International Spaceport can capture a portion of the market, can certainly be built and operated efficiently, and can be profitable for the investors. If this proves to be correct, it is obvious that someone from the worldwide aerospace community will be delighted to accept the management role in Australia if a U.S. firm is not allowed to do so. If this happens, then most of the benefits that I have enumerated will be lost to the U.S. In addition, we could very well see numerous Soviet launch sites throughout the world, some of which, as I said before, could be subsidized.

In other words, the Soviets will ultimately enter the commercial market somewhere in the world, we believe. The threat will not go away. We have an opportunity in this program to join with the Australians and the Soviets to create a commercially-viable spaceport that will offer comparable, competitively priced systems to the worldwide aerospace community.

I thank you.

[The prepared statement of Joseph Mirth follows:]

Cape York International Spaceport

Presentation to

Subcommittee on Space Science
and Applications
Committee on
Science, Space and Technology

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By
J. Donald Mirth
Sr. Vice President
UTC/USBI Co.

November 30, 1990

Kennedy Space Center, Florida





We at USBI appreciate the opportunity to discuss the Cape York International Spaceport project with the U.S. House of Representatives Subcommittee on Space Science and Applications.

In 1987, the State Government of Queensland, Australia issued a Request for Quotation for a study to explore the feasibility of locating a spaceport on the Cape York peninsula at the far Northeastern tip of the continent.

Sixty companies responded and the winner of that competition was a private, commercial entity - the Cape York Space Agency (CYSA).

To date, CYSA has completed feasibility studies, preliminary market analyses, investigated and documented over 20 spaceport operational scenarios and 17 potential sites, completed extensive concept refinement, reached considerable agreement with the Soviet suppliers of the proposed launch vehicle and performed detailed cost analyses and related trade studies. This effort culminated in the submission of a detailed proposal to the Australian Government in late 1989. This proposal was subsequently approved and permission to proceed into the next phase was granted by the Australian Government early in 1990.

USBI Company began to explore the feasibility of the project with CYSA in mid-1988. This ultimately led to the submission of a Technology Assistance Agreement (TAA) and license application to the U.S. Government in October 1989. On 22 August, 1990, the White House announced that a U.S. firm (USBI) would be allowed to participate in the next phase of the program when three provisions were satisfied. These provisions were as follows:

- 1) The USSR will provide launch services (boosters, equipment, technology, or training) only from Cape York or any other single location;
- 2) The USSR and Australia will observe the Missile Technology Control Regime; and



- 3) U.S. regulations on technology transfer to the Soviet Union will be observed.

All of the provisions are still the subject of negotiation between the interested parties.

The Spaceport is based upon the concept that an economically viable and profitable spaceport can be built, activated and operated with private investors providing the funds for the start up and activation. This concept does not depend on any subsidy by the Australian Government. It is international in its implementation and includes Australian investment and corporate management, UTC/USBI program management and operation, and Soviet launch vehicles and Support Equipment. I will elaborate on these responsibilities later, but first I'd like to address why Cape York was chosen as the site for the Spaceport.

Advantages of the Cape York site are the stable political situation and very friendly Government. In addition, the climate is relatively moderate. However, as those of us who have visited the site know, there is nothing there, and it is very remote. Therefore, the town, infrastructure and support facilities must all be established and maintained by the developer.

The current plans call for the Spaceport to be located at Temple Bay on the northeast coast of the continent. This means that the site is within 12° of the equator compared with 28° at Cape Canaveral and almost 57° at the Soviet launch facility at Baikonur. The result is an increased lift capability for geosynchronous orbits when compared to those sites.

The proximity to the equator means that the same vehicle could launch about 15% heavier payloads to geosynchronous orbit from Cape York when compared with a launch from Cape Canaveral. A launch from Baikonur in the Soviet Union would be more than 35% less in payload capability depending on the configuration.



Conversely, there would be a slight 1% to 2% loss when compared to a launch from Korou, the Ariane space facility on the northern shores of South America.

The Zenit when launched from Cape York will launch a heavier payload to geosynchronous orbit than a commercial Titan launched from Cape Canaveral. At the same time, it could launch more than 60% more than Atlas Centaur and 140% more than the Delta II from Cape Canaveral. It also compares very favorably with the Ariane stable of launch vehicles, and consequently, it is this segment of the commercial market (more than 50%) that CYSA is primarily focusing upon.

The planned business arrangement is one in which the Cape York Space Agency (CYSA) will establish an equity partnership to fund the spaceport. They will then act as the corporate leader holding two major contracts. The first will be with USBI to act as the program manager and operator of the launch facilities, launch vehicles, ground support equipment, etc. In addition, USBI will function as the worldwide marketing organization and -- very importantly -- will perform all mission planning and payload integration. This means that the worldwide satellite makers will work directly with a U.S. organization for all activities leading to a launch. There will be no Soviet involvement in this activity nor will there be any Soviet presence at the Spaceport after the first two launches.

The second major contract held by CYSA will be one in which the Soviets will supply the Zenit SL-16, liquid oxygen/hydrocarbon fueled rocket which functions either as a space launch vehicle or as the boosters on the Energia and Buran. This system was developed in the early 1980's and first flew in 1985. It represents the newest launch vehicle currently in operation in the world and was designed for safe, reliable, responsive operation with fully automated, robotic ground processing and launch systems. The Soviets claim that it can be launched with fewer than 150 people within 24 hours of delivery to the launch pad. This capability results in a substantially reduced



cost of operation when compared with the more manpower intensive, vertically integrated systems that have been the standard for decades and are still in use today.

Reports also indicate that the Zenit was successful on all of its first 23 launches until a failure occurred recently. The failure analysis is underway, but preliminary reports suggest that contamination in a LOX system as a result of a human and procedural error was the cause of failure.

In order for CYSA/USBI to operate the Soviet ground support equipment and the launch vehicle and to subsequently perform the mission planning and payload integration, considerable detailed technical data must pass to our company. Extensive hands-on training must also be accomplished with the Soviet systems. All of these requirements are understood and acknowledged by the Soviets and are in the plans.

Mr. Chairman, inherent in the dynamics of this project is the realization that as little as two years ago, it would not have been politically feasible to even dream about American space technicians receiving training on Soviet equipment in the Soviet Union and discussing how we can accept and control Soviet technology transfer to the West. This is indeed, an exciting and historic opportunity.

Mr. Chairman, now I would like to discuss cost and price.

The cost of the launch vehicle is only one of many cost elements that must be considered when calculating the cost of a launch.

In the Cape York International Spaceport scenario, there are many significant costs that must be fully covered by the developer/operator because there is no Australian Government funding. Items such as the infrastructure, town, port, airport, roads, range facilities, etc., must be fully funded for establishment and operation.



Discussions that argue that the Soviet launch vehicle is from a non-market economy and therefore represents unfair competition ignore the fact of the past and existing subsidies that must be considered to balance the total cost equation. We feel that the real question should be "What is the cost of the launch when the satellite is delivered to orbit"? When that question is answered, I believe you will find that the launched cost of a Zenit from Cape York will be comparable but competitive with the other launch vehicles of the world. I cannot yet tell you what the price will be because we have not been permitted to engage fully with CYSA nor the Soviets because of the delay in the approval of our license application. However, I can assure you it will be in the range of the current price for delivery to orbit.

There are a host of significant benefits to the U.S. participation in the Cape York International Spaceport program.

One of the U.S. Government provisions to the USBI license approval is that the Soviets would limit all of their launch vehicles to one site outside of the Soviet Union. This simply means that we would not see, for example, Protons in Brazil and Zenits in Indonesia and other systems elsewhere. If the U.S. doesn't participate in this program and the Soviets do not agree to that provision, we could see their launch vehicles scattered throughout the world and the launch facilities, ranges etc., could be fully subsidized thus exacerbating the problem of significant launch price cutting.

The other provisions of the U.S. policy would require a U.S./Soviet agreement that would control the worldwide proliferation of missile and launch vehicle technology and potentially, additional competition in the future.

By allowing a U.S. firm to participate in this program, the U.S. Government will open up a host of other business opportunities to U.S. industry. The possibilities run the gamut from Upper Stages to hardware for the townsite. In addition, there will be export



opportunities for U.S. satellites integrated by a U.S./Australian organization. Of course, the launch services supplier will have the export opportunity also.

The Australian Government has tentatively agreed that significant offset credits could be generated by participation in this program. They have also indicated that they can be traded, sold and banked. This results in keeping dollars and jobs here in the U.S. versus sending them overseas to discharge an offset obligation.

Participation in this program also has the advantage of further improving the newly emerging U.S./Soviet cooperative relationship. The fact that they have agreed to offer their newest most sophisticated launch vehicle and all technical data to an Australian/U.S. organization is astounding in itself. We cannot walk away from the opportunity to expand our knowledge base by learning how the other great space faring nation designs and operates their launch systems.

This program could well become one of the prestige programs on the entire Pacific Rim. By participating with our staunch ally, Australia, we could be opening the door to the world's first truly commercial International Spaceport.

In summary, our evaluations to date indicate that the Cape York International Spaceport can capture a portion of the market, can certainly be built and operated effectively and can be profitable for the investors. If this proves to be correct, it is obvious that someone from the worldwide aerospace community will be delighted to accept the management role in Australia if a U.S. firm is not allowed to do so. If this happens, then most of the benefits that I have enumerated will be lost to the U.S. In addition, we could very well see numerous Soviet launch systems sited throughout the world some of which could be heavily subsidized. In other words, the Soviets will ultimately enter the commercial market somewhere in the world. The threat will not go away. We have an opportunity in



this program to join with the Australians and Soviets to create a commercially viable spaceport that will offer comparable, competitively priced systems to the worldwide aerospace community.

Cape York International Spaceport

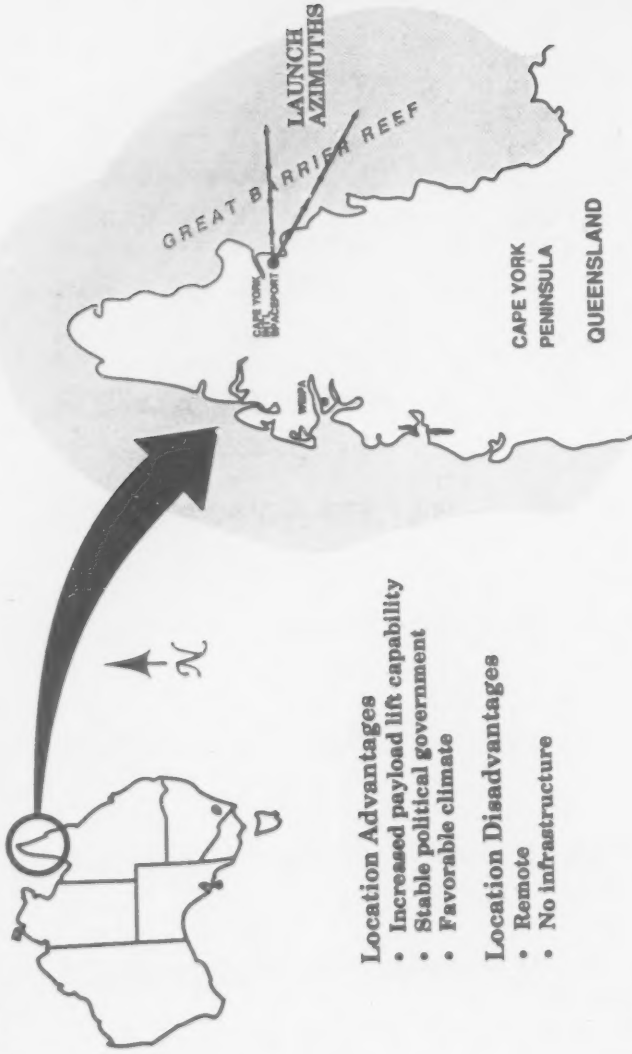
The Concept

- Private enterprise will endeavor to design, construct, and operate an economically viable commercial spaceport at Cape York, Australia.
- Not subsidized by the Australian Government.
- The concept is international in its implementation. Includes Australian investment and corporate management; UTC/USBI program management, development, and operation; and a Soviet launch vehicle and support equipment.



Cape York International Spaceport

The Site



- Location Advantages**
- Increased payload lift capability
 - Stable political government
 - Favorable climate

- Location Disadvantages**
- Remote
 - No infrastructure

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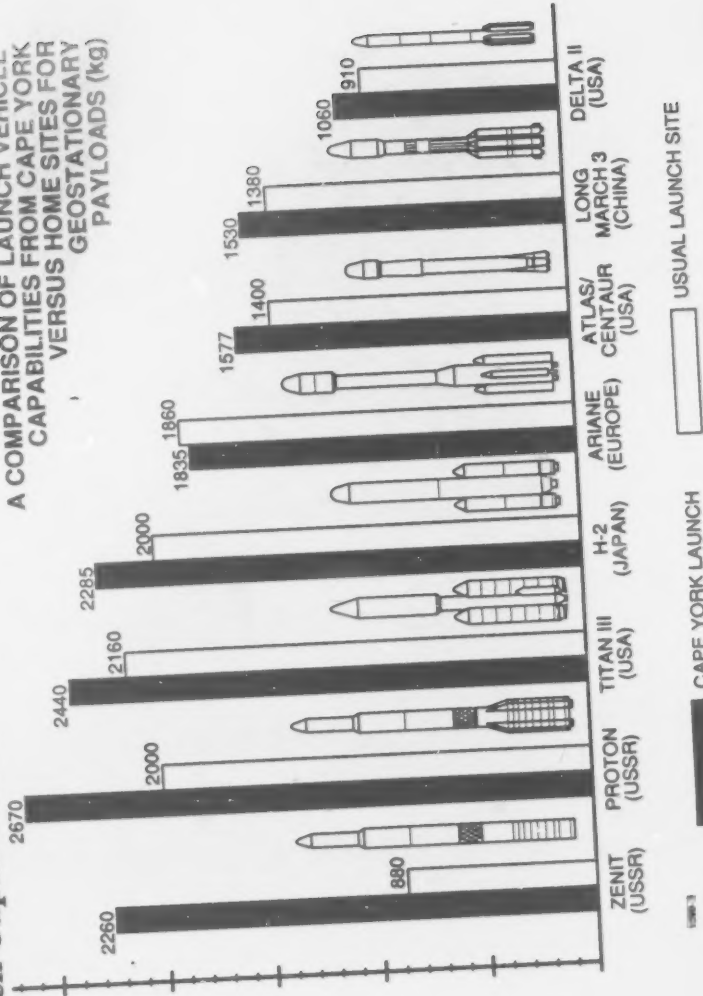
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Cape York International Spaceport

Launch Capabilities

A COMPARISON OF LAUNCH VEHICLE CAPABILITIES FROM CAPE YORK VERSUS HOME SITES FOR GEOSTATIONARY PAYLOADS (kg)



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Cape York International Spaceport

Business Arrangement

CYSA Corporate (Equity Partnership)

- Financial package
- Infrastructure development
- Land lease/purchase
- Contract with Soviets for launch vehicles/GSE/data
- Contract with payload customers



Contracts with USBI for design, construction, and operation of Cape York (Cost-Plus Fixed Fee Contract)

USBI

- Program management
- Develop design and operational requirements/specifications
- Manage site design and construction
- Negotiate Soviet contract
- Manage training program in Soviet Union and at Cape York
- Market launch capability worldwide
- Payload integration and mission planning
- Conduct launch operations



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Cape York International Spaceport

Soviet Participation

- Supply Zenit (SL-16) launch vehicles with automated processing and launch equipment.
- Supply training and all Zenit technical data to launch operator (USBI).
- Soviets will not have on-site representation after two demonstration launches.
- Not a sale of U.S. technology to foreign entities; CYSA will purchase Soviet technology and hardware and transfer it to the launch operator.



Cape York International Spaceport

Commercial Issues - Cost and Price

- CYSA cost/price elements:
 - Infrastructure/town/port/airport/roads-development, construction, and operation
 - Range
 - Processing and launch facilities
 - Ground support equipment
 - Launch vehicle
 - Expendables
 - Operations and maintenance for all elements
 - Training, relocation, remote site incentives
 - Worldwide marketing
 - Debt/equity servicing
 - Maximize return on investment
- Cost of the launch vehicle is only one element of the total cost.
- CYSA must pay these cost elements in full. No Australian Government funding, tax, concessions, or other subsidies.



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Cape York International Spaceport

Benefits of U.S. Participation

- Limiting USSR launchers to one site precludes uncontrolled proliferation.
- Missile technology transfer can be controlled.
- Paces Soviet entry into the commercial market.
- Provides opportunities for other U.S. suppliers, i.e., upper stages, range and data systems, support equipment, town and infrastructure hardware, etc.
- Offers export opportunity for U.S. launch service supplier.
- Provides export opportunity for U.S. satellites, with U.S. payload integration.
- Provides major offset credit opportunities to U.S. industry.
- Provides U.S./Australian competition to dominant commercial carrier, Ariane.
- Enhances U.S. technology base in commercial launch market. Technology transfer is from Soviets to launch operator.
- Enhances U.S. position on the Pacific Rim.



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Cape York International Spaceport

Summary

- The Cape York Spaceport Project:
 - Can satisfy a market element with competitive, reliable, and responsive launch service.
 - Can be built, activated, and operated effectively.
 - Can be profitable.
- Assuming the above is correct:
 - Someone from the worldwide aerospace community will be willing to accept the management role.
 - Benefits will be accrued by others if U.S. does not participate.



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J. Donald Mirth is currently the Senior Vice President for Advanced Engineering and Technology Development for United Technologies Corporation/USBI Co., in Huntsville, Alabama. His current programs include the Australian Cape York Spaceport, the Shuttle C development and several robotic coating application and removal programs. Previous UTC assignments included a four-year period with Norden Systems as the Joint Stars Radar Program Manager.

Prior to joining UTC, Mr. Mirth was a career Air Force officer retiring as a Brigadier General in 1982. At that time, he had served for four years as the Air Force Director for the Space Shuttle, IUS, CSOC and all expendable launch vehicle and upper stage programs. His responsibilities included the development, construction and activation of the SLC-6 Space Shuttle launch complex at Vandenberg Air Force Base, California, plus other facilities at Cape Canaveral and Johnson Space Center. This assignment was the culmination of an Air Force career primarily focused on Air Force space systems and launch facilities. Beginning in 1959, he was instrumental in the initial development and activation of both Atlas and Titan Space Launch Complexes 3 and 4 at Vandenberg Air Force Base. He had a variety of assignments including Launch Director, Program Manager and Center Vice Commander. He is a veteran of more than 250 launches of every space launch vehicle the Air Force has ever employed.

Mr. Mirth was a Command Pilot with over 3500 flying hours. He holds a Master of Science degree in Mechanical Engineering from Oklahoma State University. His wife, Alice, and he have six children and reside in Huntsville, Alabama.

Mr. NELSON. Thank you, Mr. Mirth.

Mr. Del Riego.

Mr. DEL RIEGO. Mr. Chairman and Mr. Vice Chairman, thank you. I'll summarize my statement, also.

It's a pleasure to appear before you today to express the views of Hughes regarding the issues affecting the commercial expendable launch vehicle industry.

As you know, we are here mainly because the same issues critically impact the commercial spacecraft industry, so the views presented here today are going to be from the viewpoint of a spacecraft manufacturer and system operator.

As you know, today Hughes has built half the communication satellites now in orbit. We are also the largest private owner and operator of satellites in the world. We now own and operate 13 of our own satellites and we've got in construction or in planning, in firm planning, 13 more satellites. In the very near future, our fleet size will be larger than that of the INTELSAT organization.

In the last decade or so we have purchased 21 launches. In the last three years alone, we have commercially purchased 13 launches, worth about \$600 million, and we hold options now for 13 more launches, valued at over \$800 million.

I would like to point out—We were speaking of perceptions earlier. I would like to point out that, of those 34 launches, 26 of them, or very close to 80 percent, utilize U.S.-made launch vehicles.

Our general position regarding the commercial ELV industry is as follows:

It still remains largely a government-driven market, and the commercial part of the market is definitely smaller than the government side, although it is financially important. We estimate that there are approximately 15 or 20 commercial launches per year worldwide, and that should continue for about the next few years. Ariane, as we've heard, launches about half of those, or slightly more than half of those, today, and the U.S. ELVs launch the other half, with the exception of the Chinese Long March that has four launches on its schedule right now.

It is true that we are being approached aggressively by China and somewhat by the USSR, and a little less aggressively by Japan, as new entrants into this market. They are interested in us as potential customers—and others may not be far behind.

The first point we'd like to make regarding this is that, at present, U.S. Government launches are required by national policy to be launched on U.S. ELVs. We think this is a prudent policy and probably should not be traded for the promise of a free market policy, as is currently being suggested by our European friends. This assured Government market is critical to the health of the U.S. ELV industry and, in addition, we should not, for obvious reasons, become dependent upon any other country for our Government-guaranteed access to space.

In the commercial launch arena, however, the commercial spacecraft industry is critically dependent upon free market access to all the same worldwide launch capabilities as our international competitors. This market is very fiercely competitive and the winning margin is often very slim. And a combination of several factors, none of which is sufficient by themselves, but which, all combined

together with low price, give you a very slim margin of victory or defeat. The important point is, though, that low price is always the cost of entry. Without low price, no other factors can combine to give you the victory. With low price, you have a chance. So if we enter into any competition with an unfavorable price differentiation between us and our competition, we have lost.

We are speaking today about, for Hughes alone, annual sales related to commercial space communication services, of about \$800 million, and approximately half of these sales are international. So we contribute quite a bit to the balance of trade. If we're talking about the total market for U.S. manufacturers and service providers, that's about \$4 billion a year. Success in this marketplace, which is again very highly competitive, requires maximum flexibility.

This past year we launched eight spacecraft and one major payload on five different launch vehicles, including the space shuttle, the Titan, the Delta, Long March and Ariane. If we had been restricted to U.S. launch vehicles, this successful picture may have been altered significantly.

Increasingly, the international buyers especially want to select the best combination of satellite and launch vehicle which is best for them. We don't normally—we decreasingly have the option of selecting the launch vehicle for our customers, and when we do, it's within the frame work of lowest price.

As you know, in the recent Aussat competition, the selection of Hughes as the winner is conditional on the use of the Chinese Long March. This agreement is currently in effect but still, through various interactions between our Government and the Chinese Government, is still a little bit shaky. This is several hundred million dollars again of export business, and if Hughes is not permitted to do this, then the Europeans and Japanese and others will be happy to fill that gap.

We are in favor of a free market policy. However, free market with regard to the launch services market is difficult to define and implement. Low prices by themselves are not necessarily evidence of unfair competition. And the experience of the Chinese Long March is a prime example of this. They can underprice by about half an equivalent American ELV, and yet to date they have only four launches scheduled through 1994.

The answer is that there is a lot of factors that go into selecting a launch vehicle, and price is a very important one. However, other things such as technical performance, reliability, insurability, schedule availability, logistical support, technology transfer protection, political constraints and so on really enter heavily into the decision. So even in the perfect market, without subsidies and adding competitive behavior and so forth, the value of a specific launch vehicle will be different to different buyers at different times and in different overall business and political circumstances.

In addition, history shows that smart spacecraft buyers will always split their buys. They don't want to rely on a single ELV because they know that a faulty pump or a seal or some other problem can ground an ELV indefinitely. For instance, we have seen with the INTELSAT spacecraft, INTELSAT VI's, where the Titans are launching three, Ariane is launching three—and I can

name other programs where this same philosophy applies. You split the launch vehicles to guarantee your access to orbit.

Also, everyone is very aware of what happens to the prices of a low-cost supplier when he's allowed to become the sole-source supplier. This also protects against that. So, rather than the defensive approach of trade restrictions, we prefer offense. We prefer to revitalize—that the U.S. ELV industry be revitalized, and its infrastructure be revitalized. There's a lot of necessary and overdue major improvements to the industry and to the infrastructure, and these improvements are required to protect \$40 billion a year of NASA and DOD space programs, in addition to the much smaller commercial market. So that the policy should be developed which addresses these issues required for launching our Government programs and at the same time enhances our commercial ELV export capability.

We've got about a five-year window, critical launch window, because in 1995 several things will happen. The Ariane V will be on line, which we heard about earlier today as a result of a \$5 billion investment by ESA. The Japanese H-II rocket will be ready for commercial application in the mid-90s. The Cape York project, even though it's currently having difficulties, will probably be on line at about that time. And the new Chinese Long March 2E will be ready for commercial operations. This Long March 2E will match the Ariane IV in performance and will be lower in cost. So there's a critical time window involved here as well.

The U.S. right now has no comparable nationally directed program. We have a very good program this year amounting to over \$300 million to support aeronautical R&D, and much of this effort is directly applicable to commercial aviation. We all know that the past success and safety performance of the U.S. aircraft industry worldwide has been significantly enhanced by the NASA R&D support over the years. This might be a good model to follow for ELVs as well.

I would add that the element of product improvement, not just R&D for ELVs, but improve what we have, continuing to improve what we have once we have it. At the same time we must deal with the Europeans, Chinese, Russians and Japanese from a fair and free trade standpoint, defining the reciprocal rules of the road which will provide equitable market access to all parties and minimize restrictions. We should demand reciprocity. For instance, if they can sell launch vehicles to us, we should be able to sell, for instance, communications spacecraft to them. Currently, in the Chinese and the European government markets, our commercial spacecraft industry is restricted.

That way, we can have a policy which will strengthen our ELV industry and at the same time encourage international free trade, and at the same time maintain our position as the world's leading supplier of communication satellites.

In summary, Mr. Chairman, the issues facing the ELV industry today also critically impact our commercial spacecraft industry, and the resolution of these issues will impact the future of our entire space program, not just the commercial ELV portion or the commercial spacecraft portion, but the entire space program. We recommend a strong, well-funded, focused and aggressive R&D pro-

gram for US ELVs, and again I would include infrastructure improvements and product improvements in there, as a way to get our ELV industry in a position to support not only our Government launch requirements but would also compete commercially worldwide on the basis of price and performance rather than through protectionism.

Prior to any free trade agreements, we would request that we should take time to fully understand what free trade means in this particular context. It is a very complex issue, and in any case, a strong Government R&D and product improvement program should be firmly in place prior to major specific agreements so that the U.S. can negotiate from strength.

That concludes my summary, Mr. Chairman.

[The prepared statement of Joseph Del Riego follows:]

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

**SUBCOMMITTEE ON SPACE, SCIENCE, AND
APPLICATIONS**

U.S. HOUSE OF REPRESENTATIVES

**- ISSUES AFFECTING THE COMMERCIAL EXPENDABLE
LAUNCH VEHICLE INDUSTRY**

STATEMENT OF:

**JOSEPH DEL RIEGO
DIRECTOR, MARKETING
SPACE AND COMMUNICATIONS GROUP
HUGHES AIRCRAFT COMPANY**

NOVEMBER 30, 1990

Mr. Chairman, it is a pleasure to appear before you today to express the views of Hughes Aircraft Company regarding the issues affecting the commercial expendable launch vehicle (ELV) industry.

Our last opportunity to appear before your subcommittee was in September 1987. I would like to express the Hughes position, with emphasis on events and developments since that last appearance.

As you know, the ELV issues are critically linked to the continued international preeminence of our United States commercial communications satellite industry. The views presented here are from the viewpoint of a U.S. spacecraft manufacturer, system operator, and global communications service provider. As a manufacturer, Hughes has built half the communications satellites now in orbit. We are also the largest private owner/operator in the world. Hughes now owns and operates 13 satellites in orbit. We currently have five more of our own spacecraft in production, and an additional eight planned. In the near future, our fleet size will be larger than that of the global Intelsat organization. Our satellites provide communications on five continents and in almost every nation in the world.

We have purchased 21 launches in the last decade. In the last three years alone we have commercially purchased 13 launches worth more than \$600 million, and hold options for 13 more valued at an additional \$800 million. I would like to point out that of this total of 34 launches plus options, 26 (77%) utilize U.S.-made launch vehicles.

To date, the total value of our contribution to the balance of trade with Japan, including satellites and U.S. launches, approaches \$500 million.

The Hughes position regarding the commercial ELV industry may be summarized in the following fashion:

1. The world ELV market remains driven basically by government launch requirements. The commercial ELV market is a relatively small, but financially important, fraction of the total ELV market. The commercial ELV market still consists largely of the launches required for commercial communications satellites (approximately 15-20 per year worldwide). Ariane currently launches slightly more than half of these satellites. With one exception, ELVs manufactured by the U.S. currently launch the other half. ELVs manufactured by China, the USSR, and Japan are new entrants into this market. Others may not be far behind.
2. U.S. Government launches, in contrast to the smaller number of commercial launches, are required by national policy to be launched on U.S. ELVs. This seems a prudent policy and probably should not be traded for the promise of a "free market" policy, as is currently being suggested by our European friends. This assured government market is critical to the health of the U.S. ELV industry. In addition, this country cannot, for obvious reasons, become dependent upon any other country for guaranteed access to space.

3. In the commercial launch arena, however, the success of the U.S. commercial spacecraft industry is critically dependent upon "free market" access to all the same worldwide launch capabilities as our international competitors. Any policy that would artificially constrain commercial launch vehicle options would serve no purpose other than to place an internationally successful U.S. industry in needless peril. The commercial communications market is fiercely competitive. At times, victory involves not only besting other spacecraft manufacturers, but also winning over alternate forms of service. Increasingly, such factors as international financing and trade offset provisions are critical. Often it is a combination of several factors, none sufficient by themselves, which combine with lowest price to provide a slim margin of victory or defeat. However, low price is always the cost of entry. There is virtually no combination of other factors which will overcome an unfavorable price differential between you and your competition.

Today, Hughes has annual sales related to commercial space communications services of approximately \$800 million. Approximately half of these sales are international. The total annual market for all U.S. manufacturers and service providers is approximately \$4 billion. Success in this highly competitive marketplace requires maximum flexibility.

In 1990, Hughes launched eight spacecraft and one major payload on five different launch vehicles, including the STS, Titan, Delta, Long March, and Ariane. Had all these launches been restricted to U.S. ELVs, it is quite likely that this successful business picture would have been

altered significantly. In this environment, trade barriers and restrictions are dangerous. International buyers of satellites prefer to choose the best overall satellite and launch vehicle combination for them. For example, in the recent Aussat competition, the selection of Hughes as the winner was conditional on the use of the Chinese Long March.

Restricting U.S. satellites to only U.S. ELVs could be catastrophic to the U.S. international satellite industry. The Europeans, the Japanese, and others would be happy to fill the gap.

4. Hughes is strongly in favor of a free market policy. However, "free market" with regard to the launch services market is difficult to define and implement. For instance, low prices, by themselves, are not necessarily evidence of unfair competition. Witness the Chinese Long March. It is priced at approximately one-half the cost of an equivalent U.S. ELV. The agreement between the U.S. and China permits nine launches of U.S. satellites in a six-year period. China has been marketing the Long March aggressively for some time. To date, there are only four U.S. launches scheduled on the Long March through the first four years of this agreement.

Why, if price is so important, are not U.S. and European, and other world satellite builders flocking to fly on the Long March? The answer is that services provided by different ELVs are not homogeneous or directly comparable in many cases in terms of technical performance, reliability, insurability, schedule availability, logistical support, technology transfer protection, political constraints, and so on. Even in a perfect market without subsidies, anti-competitive behavior, dumping, government

intervention, and so on, the value of a specific ELV will be different to different buyers at different times and in different overall business and political circumstances.

In addition, a viable commercial ELV market is somewhat self-generated and supported by the users. Major spacecraft buyers know full well the risk associated with placing total dependence on any single ELV for getting a satellite system into orbit, no matter how low the price of that ELV might be. Satellite systems with billions of dollars of scheduled service and revenue at stake cannot chance lack of launch availability, and possible business failure, due to a faulty pump or seal that may indefinitely ground a specific ELV. Major users will tend to distribute launches among available ELVs, even though one may be less expensive than the other, in order to guarantee access to orbit. This also protects against that phenomenon which tends to occur in the prices of a "low-cost supplier" when that supplier is permitted to achieve a sole-source position. Witness the dramatic increase in certain ELV prices in the year following Challenger.

5. Rather than the defensive approach of trade restrictions, Hughes prefers offense: The U.S. must revitalize its ELV industry and infrastructure. The major use of ELVs is launching spacecraft for the U.S. Government. Necessary and overdue major improvements to our ELV industry and infrastructure are clearly required to protect \$40B yearly in NASA and DoD space programs. A thoughtful policy must be developed where the acquisition of the capability required for launching Government ELVs

also enhances our commercial ELV export capability. This will also strengthen our satellite export industry.

For example, The European Space Agency (ESA) is spending \$5B to develop the technology and infrastructure for Ariane 5 to reduce launch costs by 40 percent. This capability will be available to Arianespace by 1995 and will have a serious impact on the competitiveness of the U.S. ELV industry. The new NASDA-developed Japanese H-II will be ready for commercial use in the mid-90's. The Cape York project, which will utilize the USSR Zenit, is proceeding. The Chinese are developing the new Long March 2E, which will match the Ariane 4 in performance and will be lower in cost.

The U.S. has no comparable nationally directed program. The closest is the joint NASA/DoD ALS program; however, this program is unfocused because of conflicting views on the objectives and funding problems. NASA's prime objectives are space station, EOS, and SEI. DoD must deal with the nation's defense in the face of a declining budget. The Air Force has taken the most initiative in developing ELVs to support its space programs, but its ELV program represents minimal modification of 30-year-old technology in the Titan, Thor, and Atlas programs.

This year, NASA is spending over \$300M to support aeronautical R&D. Much of this effort is directly applicable to commercial aviation. In fact, the great success, performance, and safety of the U.S. aircraft industry worldwide has been significantly enhanced by continued healthy NASA R&D support over the years. This is a good model of government and

industry cooperating effectively for mutual benefit. A similar program dealing with ELV R&D, including commercial requirements, could prove very effective in enhancing the U.S. ELV industry's international competitiveness.

Meanwhile, we must deal with the Europeans, Chinese, Russians, and Japanese from a fair and free trade standpoint. We must define reciprocal rules of the road which provide equitable market access to all parties and minimize restrictions. For example, if China is allowed to sell launch vehicles to the West, then the West should be able to sell satellites to China (without technology transfer).

A thoughtful U.S. commercial ELV policy of strengthening this nation's ELV industry while encouraging international free trade will both enhance the U.S. position as a world's major supplier of launch services and maintain our position as the world's leading supplier of communications satellites.

In summary, Mr. Chairman, major commercial ELV policy issues face our country today, which also critically impact the U.S. commercial spacecraft industry. Resolution of these issues will impact the future of this country's entire space program. The U.S. ELV industry should be fully supported. A well-funded, aggressive, focused, and integrated R&D program, similar to NASA's support of commercial aircraft R&D, should be implemented for U.S. ELVs. The result could be a vital U.S. ELV industry that would support the government's launch requirements, and would also compete commercially worldwide on the

basis of price and performance rather than through protectionism. The efforts of such organizations as the Florida Spaceport Authority and Comstac, among others, are serving to focus proper attention on the relevant issues.

The continued success of the U.S. commercial communications satellite industry depends upon having the same access to worldwide launch capability as our international competitors. This success stimulates the viability of multiple, including U.S., ELV manufacturers because of schedule reliability, performance, and future price considerations. It is synergistic for both industries.

Prior to any "free trade" agreement with our international partners, we should take time to fully understand what "free trade" means in this particular context. It is a complex issue. In any case, a strong R&D program should be firmly in place prior to major specific agreements so that the U.S. can negotiate from strength.

This concludes my remarks, Mr. Chairman. I would be pleased to respond to any questions from the subcommittee.

Thank you.

BIOGRAPHY**JOSEPH DEL RIEGO**

With Hughes 1964 to 1969 and 1977 to present. Appointed Director of Marketing for Hughes Space and Communications Group in December 1989. From 1984 to 1989 was Program Manager for Japanese Geostationary Meteorological Satellite (GMS). Prior to 1989, positions included Marketing Manager for Hughes NASA Systems Division and Project Manager for new business development projects.

During the 1970's, served on the staff of the U.S. Congress, House Committee on Science and Technology, and later as Director of Congressional Liaison for NASA.

Began career in 1963 after graduating from Penn State with a B.S. in Engineering and Mathematics. Worked as an engineer on early space programs including IDCSP, Intelsat 2, ATS, TACSAT, and other government programs.

Currently resides in California. Two grown children. Enjoys sports and reading.

Mr. NELSON. Thank you, Mr. Del Riego.

Mr. Walker.

Mr. WALKER. Mr. Mirth, when you talk about the cost of your program—and I think it was useful to understand the totality of the costs involved in it—but for the vehicles themselves, how are you figuring cost on those vehicles at the present time since there is no convertible currency out of the Soviet Union?

Mr. MIRTH. The price of the vehicle is being negotiated between the Australians and the Soviets, and cost is very difficult to figure.

Mr. WALKER. Well, I mean—

Mr. MIRTH. The cost to the Australians will be a part of a contract.

Mr. WALKER. But are the Australians going to pay for the vehicles in gold?

Mr. MIRTH. They're going to pay for it in dollars.

Mr. WALKER. They're going to buy the vehicle in dollars?

Mr. MIRTH. That's right.

Mr. WALKER. And the Soviet price for the vehicle is going to be established in dollars?

Mr. MIRTH. That's right.

Mr. WALKER. And how are they—Well, I suppose in their system, the question I'm about to ask doesn't make any sense. Because, I mean, how are they going to do that in terms of what they have paid for the vehicles? I mean, I think that's one of the concerns that's out here on the world market, is the rouble has little or no value in dollars, or at least not an established value in dollars. So there is some concern about the price that they establish in dollars, of what that really means with regard to their productive capacity. I'm not saying it will be, but you understand what my point is.

Mr. MIRTH. I understand what your point is, and that's a subject of extensive discussion in Washington. There's a good deal of concern about that factor, no question about it. But I don't know the answer to it. I don't know how that's going to be resolved.

Mr. WALKER. I mean, it's a problem that the Soviets are going to have to face in terms of being able to participate in the world market, period—

Mr. MIRTH. That's right.

Mr. WALKER. —and if you want to offer rides aboard their own vehicles out there on the launch pads, it's one of the issues that has to be resolved. Obviously, it's going to impact on the world market price.

Mr. Del Riego, is that a problem in terms of your negotiations with regard to riding on these various vehicles, that in several cases you now have international players that may or may not have convertible currencies. So, therefore, it seems to me that that would be a problem in any kind of trade relationships that you would be involved in in terms of riding the vehicles.

Can you describe those problems to me and give me some sense as to how we're going to walk our way through them?

Mr. DEL RIEGO. Well, our experience has been with Ariane and Long March. In both cases, we deal in dollars. So that it hasn't been a problem for us to deal with the issue of a nonhard currency.

Mr. WALKER. But with regard to the Chinese, dealing with the Chinese in terms of dollars, it seems to me would be somewhat of a

problem, not so much with the Europeans because, obviously, there is a fairly established trade relationship there, but not so much with the Chinese. Was that not a problem with the Chinese?

Mr. DEL RIEGO. We're buying from the Chinese, so we're giving them dollars, so that their price was established in dollars, we pay in dollars. So the problem of them pricing something, or something having a value in Chinese currency and converting that to dollars hasn't been something that we've encountered.

Mr. WALKER. No, it's not a problem for you in that sense, but it is a problem in terms of the overall trade picture, because no one knows what those dollars mean versus the cost of production of that vehicle in China. I mean, that's where the problem comes in. If they quote you a price of \$10 million, you know, that's fine. But we have no idea whether or not it costs them \$20 million to build the vehicle or whether it cost them \$5 million to build the vehicle. I mean, because there's not an established way of dealing with those figures, it gives us a real problem when you start talking free trade concepts.

Mr. DEL RIEGO. Yes.

Mr. WALKER. Because we don't know whether or not that is truly in the realm of free trade or not.

Mr. DEL RIEGO. Yes. And I alluded to that in my statement, Mr. Walker. It is very tough to do. We have not looked behind their prices. We're not concerned with their cost. So that what we're interested in from the Great China Wall industry is their price to us to get into orbit.

Mr. WALKER. So you're perfectly satisfied in a free trade environment, as you define it, to have massive subsidies taking place of the product that you are buying, regardless of the fact that if those massive subsidies at some point limit the market and establish something other than free trade, you could find yourself with a very, very bad situation where a monopoly will have been created and where the price then will go through the ceiling. I mean, that's something which is not a concern as you—

Mr. DEL RIEGO. That's a great concern.

We have tried somewhat to understand the cost of a Chinese launch vehicle, the Long March. At this point—and Hughes is not the best outfit to do this. But just internally we have expended some effort on it.

Mr. WALKER. So you have looked behind the cost?

Mr. DEL RIEGO. Somewhat. The conclusion we have come up with right now is that we don't know how to estimate their cost, because there is no data. I mean, we hear that a skilled laborer in China makes 35 cents an hour and pays two dollars a month for his apartment and buys a wool suit, custom made, for \$20 and things like that. I mean, you can ratio 35 cents an hour to whatever an American skilled worker makes and take the number of hours it takes us to make a launch vehicle and do a numerical exercise, but whether that has any relation to reality, we don't know. We don't know how to estimate their cost.

Mr. WALKER. The other factor is—and it's one that we have to understand in all of this. I have not been to the launch site myself, but I'm told by a couple of people who have visited that it's a fairly primitive launch site from which they do Long March, and it re-

quires very little in the way of personnel to do it. So that a large portion of the intrinsic costs of launching American vehicles, or even in comparison to the Ariane, which is considerably less infrastructure than what it requires us, the Chinese are well below that even, from what I'm told. As I say, I don't have personal experience with that, but I'm told that their infrastructure costs are very, very low compared to ours.

So it is not necessarily a fair comparison to look at only the costs of building the vehicle without examining the infrastructure question as well.

Mr. DEL RIEGO. Yes. And they don't discriminate between government and commercial—I mean, obviously, at this point. So the launch control center is there, the console operators are there, the range safety people are there, everyone is there no matter what. So whether they're launching an ASIASEAT or whether they're launching some other kind of Long March mission, I don't think the Chinese think in terms of breaking costs out and separating them. I don't know that the Chinese know what it costs them to do it.

Mr. WALKER. Yeah. I'm sure that's true. But it also is something which is a problem when we talk about a free trade market then.

Mr. DEL RIEGO. Absolutely.

Mr. WALKER. And the reason why I am someone who believes largely that the fairest trade is usually the freest trade. However, in some of these areas, you've got a real difficulty in even calculating what we're talking about in terms of the financing because you're talking about non-convertible currency; you're talking about people that have absolutely no stake whatsoever in whether or not the thing makes any money. You know, you're talking about trade areas that are very difficult to define, and you don't know whether or not you're talking about free trade or heavily subsidized trade, which is something else other than free trade. I think that's a question that somewhere along the line we're really going to have to address.

Thank you, Mr. Chairman.

Mr. NELSON. Well, just to underscore what you've said, Mr. Walker, when we set this up as a requirement, and the Congress was overlooking the administration's shoulder, in the requirements on a fair pricing policy, in order as a condition of the United States Government allowing an export license of American technology—i.e., an American satellite to be exported abroad—and the conditions set out a fair pricing policy, and the pricing policy was for the purpose of protection in a market economy, our own American rocket manufacturers.

Now, it's very clear that the Chinese have shattered that fair pricing with the underbidding—interestingly, who got it in the end was not the American rocket manufacturers but it ended up being the French, the Ariane, in this competition for the—It was offset, wasn't it? The Australians had it—

Mr. MIRTH. It was the ARABSAT.

Mr. NELSON. It was ARABSAT. So then you have to start asking the questions that Mr. Walker has asked.

Well, can we ever arrive at a fair pricing when we're dealing with a nonmarket economy, because do we really know what their

cost of producing that vehicle and the cost of producing that launch is? That brings us into some very intriguing questions.

Mr. WALKER. And as I say, even a greater burden on all of that is the fact, if they do not have a convertible currency, and you have your currency rates changing regularly in the world market, you know, we are bound to the fact that whatever the dollar is worth at a particular time is what our companies have to either win or lose on. If these are nonconvertible currencies, just the dynamics of the changing world monetary markets totally changes the picture hourly, daily, monthly, however. And these are people that have absolutely no familiarity or relationship with that at all because they're doing their own things within their domestic economies. It becomes a situation that's hardly a free trade situation.

Mr. DEL RIEGO. That's why looking at price alone is not a good indicator of what's fair or what's not fair. For instance, in the case of the Long March, where you can launch an Ariane or a Delta launch for 16, 17 percent insurance cost, and you're paying 21 percent for a Long March, for instance—the fact that the Long March requires a perigee kick motor, the fact that people don't like to go there. It's a very, very arduous duty for a launch crew, and you wonder about their efficiency. You start wondering about things that will really impact the mission, not just in dollars.

What is a fair price, or what should be compared against what, gets very difficult. It's much more than just price.

Mr. NELSON. By the way, your satellite on top of the Long March, on their first launch earlier this year—

Mr. DEL RIEGO. Yes.

Mr. NELSON. —they didn't achieve the orbit that was desired, did they?

Mr. DEL RIEGO. No, it was a very good orbit.

Mr. NELSON. It was a good orbit?

Mr. DEL RIEGO. Yes. They came very close to our orbital parameters.

Mr. NELSON. You're not going to have a reduced life of the satellite as a result of that launch?

Mr. DEL RIEGO. Not noticeably, no.

[Reply to Bill Nelson Subcommittee Hearing on Commercial Launch Vehicles follows:]

Hughes Aircraft Company has inquired of Asiasat regarding the allegation in *Space Markets* (July/August 1990) that Asiasat had lost \$15 million of revenue due to the accuracy of the Long March booster during last year's Asiasat launch.

Representatives of Asiasat have confirmed the Hughes initial response. The Long March injection parameters for Asiasat were very close to those predicted and the overall performance of the Long March was excellent.

Hence, neither Hughes nor the representatives of Asiasat substantiate or know who reportedly stated this performance loss and potential revenue penalty.

Mr. NELSON. Let me ask Mr. Mirth—

Mr. WALKER. He wanted to comment, I think.

Mr. MIRTH. Can I make a point?

Mr. NELSON. Sure.

Mr. MIRTH. There's a significant difference difference. I want to just highlight between the Long March scenario, of course, and the Cape York scenario, in that the Long March scenario includes all of those things that I laid down, that are already existing govern-

ment kinds of things, like the town, the roads, the airport, et cetera, et cetera.

The only area—

Mr. WALKER. Such as they are.

Mr. MIRTH. Such as they are, right.

The only area of question regarding price and cost and so on in the Cape York scenario is the launch vehicle, whereas in the Chinese scenario it's everything that goes with it in the price to orbit.

Mr. NELSON. On the Cape York scenario, what is being sought by your company, Mr. Mirth, is a technical assistance agreement.

Mr. MIRTH. That's right.

Mr. NELSON. Which has not been totally approved yet.

Mr. MIRTH. On the 22nd of August, the President—the White House announced that they would approve that TAA if three provisions were met, and that TAA was to cover the next phase, which is approximately the next 21 months. Those three provisions were, first of all, the exclusivity, which says that the Soviets would only launch from one spaceport, sell their vehicles to one spaceport, outside of the Soviet Union—and, parenthetically, at Cape York.

Second, the missile technology control regime would be complied with, and third, there would be—the technology transfer restrictions would be adhered to. Of course, that's for us, that we would adhere to the technology transfer requirements.

Now, the first two of those provisions are being negotiated between the State Department and the Soviet Government right now. They have not come to closure on that. The third element of it, we are in discussions with the State Department regarding those provisions on technology transfer, on how we control technology transfer.

So we do not have the signature yet, but it's in process. It's still being worked. It's not on hold.

Mr. NELSON. Did you mention the provision that is being negotiated right now, that the Soviet Union would have to agree to the U.S. Government's longstanding policy to deny exports of western satellites and satellite components to the Soviet Union?

Mr. MIRTH. That is a subset of the exclusivity. Actually, the exclusivity arrangement has two subsets, one of which was one launch port outside of the Soviet Union, and then there was a great deal of confusion—and there has been a great deal of confusion—about the part that you mentioned there. The policy ultimately came out and said that western satellites would not be flown from the Soviet Union, is effectively what it amounts to, and I believe that that's where they still are.

Mr. NELSON. That is what you understand?

Mr. MIRTH. That's right.

Mr. NELSON. Well, I have what I think is the typed version out of the White House, and under the heading "Implementing Actions" it lists three. And that is one. The other one is the single launch site outside of the Soviet Union, and the third is that the U.S. get agreement of the launch services offered commercially will be in compliance with a common approach for the entry of nonmarket economy countries, as negotiated with foreign launch providers.

Mr. MIRTH. That's for—I believe that element is for phase four, which is the next phase. That's the rules of the road establishment,

which in those negotiations are undergoing—they're being conducted with ESA right now, and then subsequently they will be conducted with the Australians.

Mr. NELSON. If you were the Soviets, would you agree to those conditions?

Mr. MIRTH. Yes, I think I would. And I believe that ultimately the Soviets will agree to that.

Mr. NELSON. Let me ask you, Mr. Del Riego, based on what you know, what you've heard of here in the testimony of the suggested improvements to the Eastern Test Range, would those make domestic commercial carriers more attractive to the international payload owners?

Mr. DEL RIEGO. I'm assuming that they would lower the costs of the operation.

Mr. NELSON. Presumably.

Mr. DEL RIEGO. Yeah. If so, very definitely. And there's no doubt that, of all the launch sites in the world right now, Cape Kennedy is the emotional favorite. It's a very good place to work. It's got good facilities, although they're very old. The transportation system and logistical support system is the best in the world, you know, within this country. There's a lot of very good things about launching from Cape Kennedy.

If the facilities were modernized and the total launch costs brought down, I would see a very definite improvement in that picture.

Mr. NELSON. Give me an idea, in the next decade, how many commercial satellites are we talking about to be competed for?

Mr. DEL RIEGO. Well, our look goes out about five to six years, and it still looks like 15 to 20 worldwide per year.

Mr. NELSON. Per year.

Mr. DEL RIEGO. Yes. Now, how many of those will actually be competed is hard to say, because, for instance, the European ones will tend not to be competed, you know, for United States firms. Some of the others will be our own Galaxy and other systems, for instance, that we own privately at Hughes, or other American companies may just fly replacement spacecraft.

I would like to go back and take a guess at that. I don't have a good number of the actual, of how many will be competed.

Mr. NELSON. Will you provide that for us, for the record?

Mr. DEL RIEGO. Yes, I would be glad to.

[The information follows:]

The competitive market for commercial communications satellites is estimated to be between 5 and 10 per year through the mid-90's.

Mr. NELSON. But you're talking about 15 a year, commercial launches?

Mr. DEL RIEGO. Yes. 15 to 20.

Mr. NELSON. And this is—generally we're talking about communication satellites?

Mr. DEL RIEGO. Yes.

Mr. NELSON. Let me ask you, Mr. Mirth, you said that, as you would project the build out of Cape York, that—I think your words were your competitor would be Ariane.

Mr. MIRTH. Primarily.

Mr. NELSON. You said clearly your competitor would be Ariane. Explain that to us.

Mr. MIRTH. The vehicle is of that size.

Mr. NELSON. Are we talking about Ariane IV or Ariane V?

Mr. MIRTH. Three and four.

Mr. NELSON. So you were talking about in competition of the pounds to geosynch?

Mr. MIRTH. That's right.

Mr. NELSON. Do you have any further questions?

Mr. WALKER. No, I'm done.

Mr. NELSON. All right.

Well, I think—Let me just summarize here. I think we laid out within five hours the whole array of complexities of this whole issue. We're moving into a rapidly changing world. Political barriers are disappearing. Nonmarket economies are becoming hybrids, and they are trying to get into market economies.

We have a strength, from the American point of view, of American launchers, but those American launchers are severely threatened as being an endangered species if things don't rapidly change. And, without summarizing everything, I think, you know, pretty much the summary of the testimony here today is pretty clear, what we have to do if American launchers, commercial launchers, are not to be an endangered species, and that the future of commercial spaceports are going to be in other locations other than Cape Canaveral or Hawaii or wherever. They're going to be in places that are in the PRC or on the southern coast of Japan or on the northern coast of Australia, or the eastern coast of Brazil or wherever, unless—and they already are on the northeastern coast of South America—if we don't make immediate changes.

A lot of those have come out here today. Some of them dovetail with the development of a heavy lift vehicle, which we talked about, in the interest of the U.S. Government. Others certainly are in the interest of the U.S. Government, an advanced launch system that rapidly brings down the cost of launch to orbit. So, without regurgitating what all has been laid out here, I think that a whole industry had better take notice as to the documentation and data that has come out of this hearing today. To be forewarned is to be forearmed.

Now, all of this has to go into the mix of the politics on the international scene, so in many cases it's no means clear. But this is very clear, that if the United States wants to keep her strength, which is at the cutting edge of technology, then she best be in the process of upgrading those systems and the equipment that have allowed us to have that preeminence in assured access to space to this point.

Mr. Walker, do you have any final comments?

Mr. WALKER. No, sir.

Mr. NELSON. All right. We thank you. The meeting is adjourned. [Whereupon, at 2:15 p.m., the subcommittee adjourned.]

